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ANNOUNCEMENT OF DATES OF CONVENTIONS.

Association of Edison Illuminating Companies, Cataract House, Niagara Falls, N. Y., September 14, 15 and 16.

Street Railway Association of the State of New York, International Hotel, September 14 and 15.

International Association of Fire and Police Telegraph Superintendents, Maxwell House, Nashville, Tenn., September 14 and 15.

Old Time Telegraphers' Association and U. S. Military Telegraph Corps, Maxwell House, Nashville, Tenn., September 15, 16 and 17.

The American Electro-Therapeutic Association, Academy of Medicine, Harrisburg, Pa., September 21, 22 and 23.

National Street Lighting Association, Neil House, Columbus, Ohio, September 28 to October 1.

American Street Railway Association, International Hotel, Niagara Falls, N. Y., October 19, 20, 21 and 22.

VIEWS, NEWS AND INTERVIEWS.

Editor McLain, of the Toronto *World*, when introduced to Mr. Chas. F. Brush, of Cleveland, who was attending the British Association meeting, inquired:

"How's Old Aleck?"

"Aleck? Aleck?" said Mr. Brush, "I don't believe I know who you mean."

"Why, Old Aleck-tricity," quickly replied the genial editor.

A moment later the distinguished electrician and the Toronto editor were engaged in a combat to the death—of two lemonades.

Isaac Glickman, a Bayonne, N. J., hardware dealer, was recently despoiled of his luxuriant whiskers and three fat mackerel while a passenger on a trolley car in transit between Jersey City and Bayonne. He sued the Consolidated Traction Company for $200, the value at which he estimated his whiskers, and is not satisfied with the adverse verdict. He has appealed to the Court of Common Pleas.

The question of coal pockets in electric lighting and power stations is receiving attention since the recent breakdown in the Paterson, N. J., station. From the investigation made by the ELECTRICAL REVIEW, it seems evident that if the coal pocket is properly designed, with first-class workmanship, there is no danger in having the coal over the boilers. A coal pocket, holding some 3,000 tons, is in satisfactory use in the Twenty-ninth street station, New York, of the United Electric Light and Power Company, and also one holding 2,000 tons is in the Thirty-ninth street station, Brooklyn, of the Nassau Electric Railway. Both of these coal pockets are above the boilers and have stood the test. They were designed and built, it is but proper to say, by the Berlin Iron Bridge Company.

The American Wave Motor Company has been incorporated by James M. Dyer, Alfred C. Goldner, Julius Goldner, John Milton and E. W. Witmer, with a capital stock of $1,000,000, the organizers having subscribed for $5 each. — *Exchange.* That makes $25. What in the world is the American Wave Motor Company going to do with all this money?

The B. & O. erecting and repair shops in Baltimore have been completely modernized. The locomotive erecting shop has been rebuilt. It is supplied with two 50-ton electric cranes, which lift the heaviest locomotives. It is stated that the cost of making the improvements will be saved in two years.

A new electrolytic copper refinery has been started near Tomsk, in Siberia.

FIG. 1.—THE BOILERS IN THE EDISON PLANT AT PATERSON, N. J., AFTER THE COAL WHICH FELL ON THEM WAS CLEARED AWAY.

A dispatch from Cleveland says that since the '60s there has been a law on the statute books of Ohio compelling city councils to advertise for competitive bids in granting street railway franchises. The records show no case where this has been done.

The United States & Hayti Telegraph and Cable Company's route to South America is now open. Messages for Brazil, Argentine Republic, Paraguay and Uruguay may be forwarded via Hayti.

A REMARKABLE PHYSICAL TEST OF BOILERS.

BY FREDERICK A. SCHEFFLER.

An accident occurred in the boiler-room of the Edison Electric Illuminating Company's new and extensive power plant at Paterson, N. J., on the afternoon of August 14, which is of unquestioned interest to all power stations of a like nature. An account of this accident and the results arising therefrom will, no doubt, be interesting to owners of similar plants.

The boiler-room is equipped with a battery of six 450-horse-power Stirling water-tube safety boilers, in the rear of which is located an economizer furnished by the Fuel Economizer Company. Over the firing-room was placed a large coal storage bin, built of sheet steel and channel beams and angle irons, the whole bin being sustained by riveted columns extending from the bottom of the coal-bin to the floor. The upper part of the coal-bin, being much wider than the base of same, projected over the top of the boilers. At the time of the accident this coal-bin contained in the neighborhood of 1,000 tons of buckwheat coal, and, as it extended from one end of the boiler-room to the other, the coal was apparently equally distributed throughout the bin. The coal was delivered to the bin by a complete coal conveying apparatus furnished by the Hunt company. Each boiler was furnished with a main steam outlet 10 inches in diameter, the pipe connections being extra heavy wrought-iron. The outlets from each boiler ran to a 12-inch main steam header immediately over the top of the smoke connections, this pipe extending the full length of the boiler-room. The accident consisted in, first, the giving way of part of that side of the coal-bin not adjoining the boilers, permitting a large quantity of coal to be precipitated on the floor of the boiler-room, entirely filling up the pump pit, in which fell at least 50 tons of the coal, and eventually this whole side parted. This threw the unbalanced weight on the opposite side of the coal-bin nearest the boilers, thus

causing this entire side of the coal-bin, together with about 400 tons of coal, to be thrown forcibly on top of the boilers and steam connections. At least 100 tons of steel girders, plates, angle irons, etc., besides the coal, were precipitated on top of the boilers. There were but two of the boilers in operation at the time, and an additional one had the fire banked ready for being put in service for the evening load; the pressure of 155 pounds was being carried on the boilers, steam mains, etc.

A fair idea of the damage which occurred to the steam main can be obtained by referring to the accompanying cuts, which show only part of the iron work on top of the boilers, as all of the coal and a large proportion of the framework was removed at the time the photographs were taken. It will be seen that the steam main was entirely demolished, and so great was the force of the fall that part of this heavy piping was smashed in as though it had been made of paper. When the side of the coal-bin fell the force was so great that when it struck the safety valves the latter pierced the one-fourth inch plate, presenting the appearance of projectiles in the plates.

It is remarkable that the only injury sustained by the boilers consisted of bending some of the short tubes connecting the upper parts of the steam drums and making slight depressions around the steam outlet of the nozzles of the four boilers.

The general impression immediately at the time of the accident was that the boilers had exploded, for the reason that, so great was the force and quantity of the steam which was liberated when the steam pipe connections broke, it was difficult to form an adequate conclusion as to just what had happened. The boiler-house became full of steam and it was very difficult for several minutes to permit even a casual examination to ascertain just what had happened. Developments soon proved, however, that the entire battery of boilers were intact, and that nothing had occurred to them except as above outlined.

No description can give even an approximate idea as to what it means to distribute 1,000 tons of coal in such a hurried manner. The boilers were buried from the floor up to a height of at least 10 feet in the coal. Fortunately, the four men who happened to be in the building at the time the accident occurred managed to escape without any injury. Much credit is due to the general manager, Mr. Brock, and the chief engineer, Mr. Merrill, in having taken such prompt and positive action in the matter of removing the coal so that within a few hours the boilers were made accessible. The natural result of having the steam pipes destroyed, of course, was the shutting down of the entire plant. Within 28 hours after the accident occurred, steam pipes were temporarily arranged so that one of the boilers could be operated, and this boiler was operated from midnight of the 16th instant until the following morning, carrying pressure steam to about 750 indicated horse-power, and for the following 15 hours the same boiler supplied steam to three of the Ball & Wood engines, developing from 1,400 to 1,800 indicated horse-power. As the boiler has a nominal rating of 450 horse power, and the engines are compound condensing, it will be seen that *the boiler was operated at least* 113 *per cent above its rated capacity* at the regular pressure of 150 pounds. Forced draught was utilized to produce the extreme overload. Notwithstanding the high percentage of overload, no trouble whatever was experienced on account of water being carried over with the steam, and no better test has ever been made to demonstrate the fact that the "Stirling" boilers furnish dry steam irrespective of the duty they are called upon to develop.

This performance of the boiler following immediately after the enormous strain brought upon it on account of the amount of coal and ironwork, without previously having made any water test to determine whether the boiler was injured in any manner, demonstrates the fact that the construction of the Stirling boiler is more than could be asked by the most exacting engineers. It also demonstrates the fact that all wrought steel in the construction of boilers can be relied upon under the most exasperating conditions, whereas if any of the parts under pressure or in the supports had been of cast-iron there would have been a weak element in the construction which would have a tendency to have produced the complete demolition of the boilers. Only the best of material was used in the bricking up of the boilers, and although they were entirely supported independent of the brickwork by wrought-steel columns and girders, it should be remarked that the results of the accident show that first-class work pays in the end, as none of the brick walls was in any manner whatsoever injured.

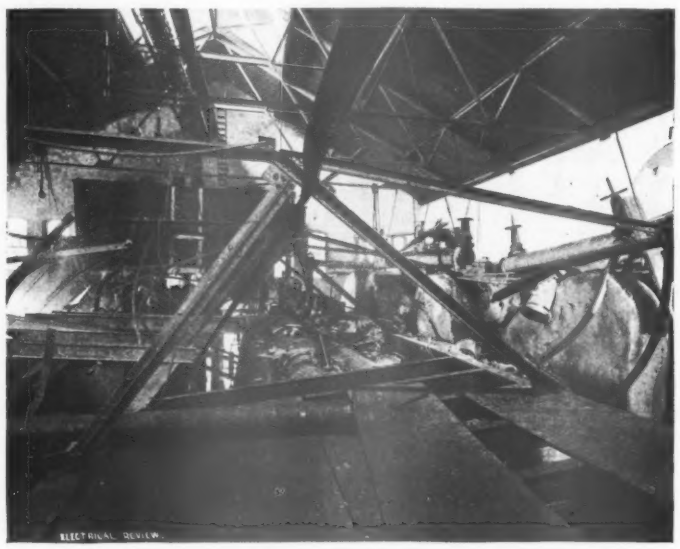


FIG. 2.—ANOTHER VIEW OF THE BOILERS IN THE EDISON PLANT, AT PATERSON, N. J.

A syndicate is considering the advisability of constructing an electric railway between Franklin and Sidney, N. Y.

FIRE AND POLICE TELEGRAPH SUPERINTENDENTS.

THE INTERNATIONAL ASSOCIATIONS CONVENE IN NASHVILLE—PRESIDENT MASON'S ADDRESS—PROGRAMME OF PAPERS AND NAMES OF ATTENDANTS.

The annual convention of the International Association of Fire and Police Telegraph Superintendents began its sessions in Nashville, Tenn., on Tuesday of this week, at 11 A. M., President Frank C. Mason in the chair.

After reading the minutes, the roll was called, and among others the following named gentlemen answered to their names: F. C. Mason and J. F. Blackwell, Brooklyn; M. W. Mead, Pittsburgh; Secretary L. Lemon, Baltimore; Capt. Wm. Brophy, Boston; John W. Aydon, Wilmington; Mr. Thompson, Richmond; Superintendent Ellicott, Chicago; S. D. Benedict, St. Louis; Adam Bosch, Newark; J. F. Zeluff, Paterson, N. J.; W. A. Barnes, Bridgeport, Ct.; W. A. Fraser, Dallas, Tex.; Henry Smith, Buffalo; Burt McAllister, Bradford, Pa.; S. L. Wheeler, Springfield, Mass.; Frederick Pearce, New York.

President Mason then read his annual address, as follows:

GENTLEMEN: In arriving at a decision as to the most suitable place at which to hold the second convention of our association, the executive committee and your president were guided largely by the desire to select a spot where our members could have some practical illustration of the most recent advances in electrical development. Nashville, Tenn., appeared to offer superlative inducements as our place of meeting, judged by this standard, and was accordingly given the preference; and, with a knowledge of the programme that has been prepared for the instruction of our members and the many interesting features for the entertainment of themselves and their friends, I am confident that, before the close of the convention, those present will unanimously be of the opinion that our choice was wisely made.

There is no parallel in history for such rapid development of any industry as that of the manufacture of electrical apparatus and its application. I fully appreciate the honor of presiding at this meeting, which, for the reasons I have just referred to, will be embodied in the annals of the association as marking an historic epoch in the advancement of the science of electricity as applied to industry.

In union is strength, and to-day our membership numbers more active members than ever before; and the financial statement, to be presented in due course by the chairman of the executive committee, will show that, after making provision for all expenditures necessary to maintain the usefulness of the association, we shall still have a small balance at your disposal.

It is certainly cause for congratulation that increasing prosperity has been followed by an access of dignity and influence, and lesser attention has been given to the merely social and entertainment features of the programme.

The desire to make the second convention notably a business meeting has so far predominated that we have neither asked nor accepted any favors.

The list of papers to be read at this convention is an exceptionally good one, and I therefore trust that our members will show their appreciation of the care and study given to the preparation of these papers, by being present in force at every session, and taking an active part in the discussion that will ensue.

Notwithstanding the progress that has been made in the perfection of apparatus and the application of new principles, there never was a time when there was more to learn than now, and no more fitting occasion is likely to present itself to us to familiarize ourselves with the latest procedure in our chosen profession, and the papers to be read and the discussion thereon will find hundreds of thousands of readers and students.

No other art, science, industry or profession has been so well and faithfully served by an enlightened and progressive technical press as our own, and who can estimate the fair share of credit justly their due for the part they have taken in aiding and advancing the introduction of electromotive force in its many and varied applications?

I quote from our constitution:

"ARTICLE II.—The object of this association shall be the acquisition of experimental, statistical and scientific knowledge relating to the constructing, equipment and operation of Fire and Police Telegraph systems, and the diffusion of this knowledge among the members of this association, with the view of improving the service and reducing its cost, and the establishment and maintenance of a spirit of fraternity among the members of the association."

With this object always in view we can not but increase in influence and knowledge, and the position of superintendent of police or fire telegraph, city electrician or electricians of wire inspection, must soon be recognized as one of the most honorable and responsible positions in a municipal government.

The subject of the papers prepared by our co-workers, Messrs. Brophy and Aydon, are especially well chosen for this meeting. These gentlemen have given the subjects upon which they write a great amount of thought and study, and are entitled to great praise for their work and attention; their efforts will certainly prove to be the feature of this our second annual convention.

After two years of hard work I congratulate you upon the fact that this association is an assured success; the opposition on the part of one or two persons only made those intrusted in the formation of this association more energetic, and spurred them on to renewed efforts to make it what it is to-day. I am pleased to say that the opposition died at its birth. We are here to stay.

The association will live long after many of us here to-day have been

called to our home above. In conclusion, gentlemen, I thank you one and all for the honor you bestowed upon me in electing me your president for the past year and the assistance you have all given me during that period.

The reports of Mr. Lemon, secretary, and Mr. Adam Bosch, treasurer, were read and referred to the executive committee, and the convention adjourned until the afternoon, to listen to and discuss the papers prepared for the occasion. The convention will continue over Wednesday.

A majority of the members are accompanied by their wives, and all are greatly enjoying their visit to Nashville. Special trips will be made to Lookout Mountain and to the famous Belle Meade race-horse breeding stables.

Mr. Frank W. McGurk, of Washington, D. C., was present, and exhibited a new fire extinguisher in which he is interested.

NOTES FROM THE WEST.

The rumor that the Westinghouse Company had purchased the capital stock of the Gibbs Electric Company, Milwaukee, has finally been verified, Mr. Edward G. Kohler, of Chicago, stating that the transfer had been completed. It is stated that the Gibbs dynamos and motors will be manufactured as heretofore at this company's shops, and that Messrs. Kohler Brothers will continue to sell Gibbs apparatus. The Chicago firm has, during the past years, built up quite an extensive and profitable business, commanding a large share of the western business, and it was but natural that the principals interested should continue the arrangement with Kohler Brothers.

The Kinloch Telephone Company has commenced to erect its poles preparatory to operating a system of its own in East St. Louis, Mo. The local manager claims to have 300 subscribers to the system at a rate of about one-half that of the Bell Telephone Company, consequently the citizens are extremely anxious to see the new system in operation, when, it is believed, a merry war in rates will be inaugurated between the rival companies. The Kinloch people have made contracts to the effect that they will have their system in running order by July 1, 1898, but the management now claims that it will have the poles up, wires strung and in working order by March 1 next.

General Manager Boss, of the Lakon Company, Elkhart, Ind., reports a most gratifying increase in the number of orders for the Lacon transformers. Mr. Boss, who is a very close observer, finds that there is very little business done in the way of increase of transformer capacity, but that the demands seem more in the way of changing from lower to higher primary voltages and for larger units of transformers to replace the unprofitable smaller sizes. The Lacon Company's new three-story brick factory, erected last Spring, is now fully equipped and turning out a large number of transformers. A new catalogue is in press, and among other interesting matter will contain some two hundred opinions from the various users of the company's apparatus. C. E. K.

The Manufactures Building at the Trans-Mississippi Exposition.

The accompanying illustration gives a good idea of the external appearance of the Manufactures Building at the Trans-Mississippi and International Exposition, which will be held at Omaha, Neb., from June to November, 1898. The Greek Ionic style of architecture characterizes the building. The order is of heroic proportions, carried out with great artistic care in every detail. The principal feature of the lagoon facade is a circular dome 150 feet in circumference, rising to a height of 75 feet. The dome is supported on a circular row of fluted Ionic columns, and the space inclosed by them and under the dome is open, forming a grand, open, domed vestibule for an approach to the building. The inner dome is richly designed with ribs and panels, and is to be decorated in colors, while the outer is formed by a series of steps rising in the form of a cone to the apex, which is crowned by a richly decorated base for a flagstaff. The outer row of dome columns is detached and the entablature is broken around them at the base of the dome, and over each column is a statue and pedestal, having as a background the stylobate of the dome. This treatment is very monumental in effect, and while in good taste and harmonious with the architectural style, it is at the same time original and interesting. Over the doorway leading from this vestibule into the building are three large panels between the pilasters to receive paintings which will be emblematical of the character of the exhibits.

Flanking the central dome are beautiful Ionic colonnades which form covered ways along the entire facade, stopping at the corner towers. Over these colonnades are balconies capable of holding large numbers of people and opening from the interior galleries of the building, affording a fine point from which to obtain an elevated view of the lagoon and the beauties of the grand central court. The four corners of the building are marked by square, plain towers surrounded by ornate, open columned pavilions, circular in form, and to serve for electric lighting. The Manufactures Building is 300 feet long and 140 feet wide. It was designed by S. S. Beman, of Chicago.

THE MANUFACTURES BUILDING AT THE TRANS-MISSISSIPPI EXPOSITION.

The Emporia, Kas., City Council has purchased the electric light plant from the Electric Light and Gas Company for $17,000.

Automatic Regulation for X-Ray Tubes.

In X ray investigations, one of the chief difficulties arises from the fact that the vacuum of the ordinary tube constantly rises and finally renders the tube useless for the production of X rays. A tube in this condition can only be used after re-exhaustion. As the result of a large number of experiments, the investigators in the laboratories of the Edison decorative and miniature lamp department, of the General Electric Company, at Harrison, N. J., have succeeded in producing, and are now manufacturing, a simple and effective X-ray tube, with automatic vacuum regulator, which it is claimed accomplishes the following point, the importance of which will be appreciated by the practical investigator: it will automatically adjust and regulate its vacuum, and produce X rays continuously and abundantly; running the tube so high in vacuum as to make it inoperative is practically impossible; the life of the tube is greatly prolonged, unless the tube is punctured or carelessly handled; the tube is extremely simple, easy to operate, and can not get out of order. These tubes will last three or four months at least.

X RAY TUBE WITH AUTOMATIC VACUUM REGULATOR.

The Utica, N. Y., Electrical Manufacturing and Supply Company has been awarded the contract for a 125-light plant for the First New York Beet Sugar Company, whose place of business is at Rome. The work of fulfilling the contract has been begun.

The Farmington River Power Company's plant, located at Poquonnock, Ct., has been totally destroyed by fire at a loss of $50,000.

ELECTRIC RAILWAY NOTES.

Reading, Pa., parties have secured the right of way to build an electric road from Shenandoah to Ringtown, Schuylkill County. The road will run over the mountain.

With the opening of the Boston subway, the West End Street Railway Company put in effect a new time schedule, which requires conductors and motormen to make nine trips per day instead of eight, as formerly.

The suit of the Pittsburgh, Pa., & Birmingham Traction Company against the Monongahela Bridge Company, to recover $152,394 for a share of the cost of the reconstruction of the bridge used by the plaintiff company, has been appealed to the Supreme Court. The lower court decided against the claim of the traction company.

P. H. Flynn, of Brooklyn, N. Y., says he proposes to begin injunction proceedings to stop the running of the De Kalb Avenue Railroad cars to Coney Island over the tracks of the Coney Island and Smith street line. He contends that the road has no legal right to the use of the Neptune avenue tracks, which afford access to the beach.

The Union Traction Company, with headquarters at Anderson, Ind., has filed articles of incorporation. The capital stock of the company is $300,000, and the road, when completed, will connect Anderson, Alexandria, Summitville, Marion, Jonesboro and Gas City with an electric line. The directors are John L. Forkner, Charles L. Henry, L. C. Carpenter and James A. Van Osdol.

Articles of incorporation have been filed with the Secretary of State for the organization of the Pekin, Tazewell & Peoria, Ill., Railroad Company. It is purposed to build and operate an electric railroad, carry passengers, United States mail, construct bridges across the Illinois River, etc., from Peoria to Pekin. The capital stock is $150,000. The incorporators are S. L. Kilmer, J. B. Berteling and Lee H. Lord. The principal office is to be maintained at Pekin, and the life of the company is 99 years.

The report of the Union Railway (Huckleberry) of its operations in the annexed district of New York city for the year ending June 30 shows a surplus for the 12 months of $86,390. The road carried 10,754,320 passengers, killed five persons and injured 16. During the year $158,743 was spent in improvements. The gross earnings of the road were $539,854; operating expenses, $323,032; net earnings, $216,822; other income, $2,999; gross income, $219,821; fixed charges, $133,431. The Southern Boulevard Railway, which is a part of the Union Railway system, reported gross earnings of $49,695; operating expenses, $22,980; net earnings, $26,714; fixed charges, $15,827; surplus, $10,886. The Southern Boulevard road carried 993,902 passengers.

AN INTERESTING REVIEW OF X-RAY PRACTICE.

Gold Foil Screen Described by Mr. Elliott Woods.

MANY IMPORTANT EXPERIMENTS INSTRUCTIVE TO THE SURGEON AND THE MANUFACTURER OF X-RAY APPARATUS—THE AUTHOR BELIEVES THAT THE DANGER FROM THE RAYS IS EXAGGERATED, AND STATES THAT THEY ARE HARMLESS UNDER THE PRECAUTIONS ANNOUNCED — BATH OF HIGH-FREQUENCY CURRENTS BENEFICIAL FOR X-RAY BURNS—TESLA'S VALUABLE WORK IN THIS NEW FIELD.

To the Editor of Electrical Review:

Some publicity has been given by the daily press to an alleged discovery made by me of a method of making the X ray harmless. In a local paper of this date considerable importance has been attached to an accidental chat with a reporter, and this so-called discovery magnified to a considerable degree. Now, to be exact and at the same time to aid, if possible, in the study of the X-ray phenomena, particularly in the application of the rays to surgical studies, I desire to correct these press reports to a considerable extent and state what really has been done.

First, nothing has been accomplished that is not the result, directly, of Mr. Tesla's already published results; and my experiments are merely modifications of his methods. Mr. Tesla utilizes aluminum sheet or gauze. I use gold leaf, such as gilders use, and this only because aluminum sheet was not to be had in the city.

My experiments having brought me in contact with a number of surgeons in the city, who desired to note the condition of injured bones which had been treated by them, I felt a natural anxiety that the patients they presented for examination should not suffer from the much-heralded results of a continued exposure to rays generated by a powerful apparatus. Previous to the publication of Mr. Tesla's article, wherein he details his experiments with tubes of platinum and aluminum anodes, and aluminum sheet or gauze earth connected, I had contented myself with brief exposures, both for photographic and visual purposes. I deemed this precaution necessary, for accounts were numerous of the effect of the rays and the patients were timid. On the other hand, from the date of Roentgen's announcement, I have exposed my person freely, both in experimenting and for exhibition purposes, and as yet have failed to receive the slightest injury. The tubes used are the most powerful obtainable, excited by various coils and high-frequency apparatus. I will return to this later.

In the course of an examination made on the foot of a patient, to locate a broken needle, I placed the tube about 12 inches from the foot, and was surprised to note, after putting the tube into action, that a tolerably heavy spark could be drawn from the bottom of the foot. In frequent shifting of the foot, necessary to properly examine and sketch the position of the small piece of needle, the patient complained of the unpleasant feeling caused by the spark, but I learned that a "hot feeling," which he mentioned early in the examination, subsided when I held his foot in my hand. It was evident that the foot in this case was the outlet for a considerable charge of electricity which the patient had been able to accumulate from the tube and wires, because of his well insulated position on the reclining-table used, and that he was relieved by the additional condenser added when I connected my body to his. Taking note of the two facts obtained in this examination, and remembering Mr. Tesla's work with the aluminum screen, I carried on some experiments with the only metal sheet I had which was sufficiently transparent, and that was gold foil. I prepared a screen about 10 by 10 inches, and of cardboard, putting on it a temporary coating of gold foil. When not connected to earth, a considerable spark could be obtained from it, which spark entirely ceased, of course, when the foil was earth connected. Placing the hand of a volunteer assistant behind this foil screen, properly connected, no spark was secured. I gave my hand generous exposure under the screen and no ill effects have been noted. Placing the screen close to the tube so that my face could be brought within six inches, I failed to note the heating sensation which I nearly always feel when exhibiting my skull without the screen. Here I wish to remark that my cheek and that portion of the body between the shoulder blades are the only portions of the body which take note of this effect. Now, it would seem that whatever danger symptoms lurk in the rays, all are effectually stopped by an earth-connected screen of this kind and one made of gold leaf on cardboard is nearly transparent on account of the thinness of the metal leaf. In fact, I have failed to find any absorption produced by it on the platinum-barium screen. There might be more shown when using less powerful tubes, but with those used by me the absorption is inappreciable. There are no special claims for this "discovery" as published. To Tesla belongs everything that attaches to it, being as it is a modification of his method. I hope, however, that experimenters will not fail to try *thoroughly* the gold leaf or other thin leaf metal, which is inexpensive, readily procurable when aluminum may not be. This type of screen, while it has proved its security, as a makeshift, in the cases where it has been used by me, may not prove safe in other cases.

I hope every one who utilizes the X-rays for more than exhibition purposes merely will study these screening effects of leaf metal, and give surgeons who desire to install suitable apparatus relief from their fears, for these fears seem to be widespread, and patients are at the present day more fearful of the ray than of the knife. In any event, I would warn the handlers of powerful apparatus to take heed of the first sensation of heat when spoken of by the patient. It is likely to be the first sign of dissolution of tissue. While patients are apt, as a result of report, to be timid, it would be well to state frankly to them the possible sensations which might be felt and ask them to control their imagination sufficiently well to give their actual sensations.

Different persons appear to differ in their sensations when under the influence of a copious generation of the rays. Some are affected at the eyelids. Some feel the sensations of an electric discharge, while others state that their hands or faces are bombarded by invisible dust. These various sensations are worth consideration. They lead me to an opinion that the majority of persons, by reason of bodily state of health, are immune, at least to ordinary exposures. Some, according to my experience, are extremely sensitive, and it would be well for operating surgeons to take carefully into account the nervous condition of the patient.

A nervous person—and by that I mean one naturally so—is a fit subject for the metal screen. Some tissues of the body appear to be more susceptible than others. Particularly does this appear to be the case with the tissues of the head. I can always experience that "hot sensation" in the head, and in that portion of the body between the shoulders, when I exhibit my heart on the screen. Other parts of my body are not susceptible. The sensations, when experienced, are unmistakable, and a sensible patient can readily give his operating surgeon the note of warning. The surgeon should know his apparatus thoroughly, and content himself with brief exposures; and here I would suggest, out of experience, that before a powerful apparatus is used, every means should be resorted to in becoming acquainted, not only with the coil used to excite the tube, but the tube also.

A coil excited by a battery, while ample for ordinary exhibitions, is apt to fluctuate in its output by reason of the fall in the exciting current. It is advisable, when the coil is to be used for surgical operations, that it be excited by a motor-generator giving a constant current and voltage, and operated by an electric lighting circuit. It is essential that the tube for such operations be of the very best adjustable vacuum type, for then the surgeon can be assured of a constancy in the generation and penetrating power of the rays. With these tubes the vacuum can be adjusted so that the rays may not, in cases of examination of the limbs, be of themselves dangerous. When adjusted for examination of the trunk, and the vacuum being maintained high to obtain great penetration, and a high voltage used in the exciting apparatus, the metal screen should be interposed. It is the indiscriminate, careless handling of the exciting apparatus that is responsible largely for accidents. The surgeon would never handle the lance except by the best and well studied method. The X-ray tube is worthy of the same study and careful manipulation.

By far the best exciting apparatus, either direct or high frequency (which can sometimes be charged by a direct-current coil), is that operated from a lighting circuit. The inconstancy of current is largely avoided and the vacuum of the tube having been adjusted can be readily maintained. This is of safe and great importance in surgical operations; and while I do not wish to cast slander on coils operated by batteries, I have found that it is hard to obtain these important items from a battery-driven coil. Confidence in your tube and coil and knowledge that the current and voltage will remain practically constant is a factor of safety to the patient.

I now beg to call the attention of surgeons to so-called burns produced by X rays. Their features are well known. The persistence against ordinary remedies, I believe, is now admitted. Some time ago I read in an article copied from the foreign press that high-frequency currents were found beneficial treatment. When, by exhibiting my skull, I experience the heating sensation mentioned before, I generally give my affected cheek a bath of high-frequency currents, from *one* terminal of the high-frequency coil. If a surgeon have a case of injury from the rays, let him try this remedy if he can find such a coil in the neighborhood. I do not say it will cure, but rather ask a trial of it; and if I may be permitted to wander from the subject a trifle, I would add to try these high-frequency currents for fresh colds, weakness of voice, and general affections of the throat, remembering that the application should be made with the hand, laying it on the throat *first*, then connecting the operating surgeon's body to *one* terminal of a weakly excited, high-frequency coil. These coils are prolific generators of ozone. Excite the coil and let the patient inhale the ozone from either a funnel and tube held over the discharge, or by getting his mouth conveniently near. If an inhaling funnel is used, it should be of rubber to prevent shock, and the patient should be allowed to use it to suit the sensitive state of the affected membranes.

From a careful study of the effects of X rays on the tissue I am led to theorize that it is an electrical decomposition of the tissue, which can be prevented by the use of the metal screen. In treating a case of burn already produced, with high-frequency currents, it would be well to use a spray discharge, avoiding carefully the spark which is apt to pass if the electrode is brought too near. I would suggest the spray of the static machine. But the main thing

is to make the X ray harmless, and whether we believe with Tesla that the rays are projections of material particles, or whether they are mere electric waves, the virus—if I may so term it—seems to be extracted when we force them to pass through a metal screen. These carriers of decomposition, in whatever form we may choose to look upon them as possessing, become apparently harmless after such a passage. The surgeon knows the utility of the X ray, but many are fearful of the effect. Manufacturers of X-ray apparatus should, by all means, further their own interests by giving competent instruction to purchasers, based on the experience of users, and particularly on the splendid investigations of Tesla, which have been published. It would be good policy for colleges to train surgeons in the manipulation of apparatus, and the subject would hardly fail of interest where so much benefit is involved and some dangers due to carelessness to be avoided.

I am inclined to believe from my personal experience that the dangers are greatly exaggerated. I am more inclined to lay bad experiences, already in evidence, to bodily conditions. I hope to experiment on this feature for the benefit of surgeons. I earnestly hope that experiences may be noted by surgeons in the handling of the rays on persons of various temperaments and that they be published in the proper journals.

In any event, it appears that X rays are harmless under the precautions named. ELLIOTT WOODS.

Washington, D. C., Sept 6.

Important Water-Power and Electric Development in Southern California.

TO THE EDITOR OF ELECTRICAL REVIEW:

Your correspondent has just returned from a trip to the head waters of the San Gabriel River, the purpose of which was to gain definite information regarding the various electric power schemes, projected or under way, on that stream. We find that the Crystal Lake Company, which takes up the waters shed from the mountains about Pine Flat, turns them into Crystal Lake, and thence by tunnels and pipes to power-house on Sycamore Flat, some 19 miles from mouth of canyon via North and Laguna Forks, has completed surveys, built diverting dams, and completed a wagon road to site of power-house. Their further plans have not yet been made public.

The Electric Power Company of Los Angeles, successor to the San Bernardino Power Company, has completed its surveys of pipe and tunnel lines, and is now locating pole line down the river. One canal will start at the mouth of Fish Creek, 25 miles from mouth of canyon as the river runs, pick up the waters of Iron Fork and the main river, and deliver them through three miles of ditch and pipe and two and one-half miles of tunnel at the head of Suzanne Canyon. Coldwater and Cattle Creeks will be delivered into the main canal by a three-mile lateral. The second canal will run from Bear Creek, by way of Sycamore Flat, in two miles of tunnel and six miles of pipe and canal, to the same place at the head of Suzanne Canyon, where the waters will unite and drop through a steel pipe 1,950 feet to the power house, 13 miles from the mouth of the canyon. The drop here is 650 feet, and is expected to furnish 4,000 horse-power. From here the waters are carried about three miles below and dropped 300 feet, developing 300 horse-power. The Electric Power Company has sold $500,000 worth of bonds with which to do this work, and has contracted to deliver one-half the power needed by the Los Angeles street railways by the first of July next, which will necessitate the immediate beginning of the work. Bids will be asked for just as soon as the specifications can be drawn from the surveys. This company has unlimited capital, both in its membership and through personal connections, and will make things move lively. The rights of way have been granted over the reservation, and the papers will be here in a few days.

The San Gabriel Power Company, whose plans have been published in detail in the ELECTRICAL REVIEW, takes up the water where dropped by the Electric Power Company and conducts it to the mouth of the canyon, dropping it into the irrigating ditches. This company has 150 men employed on tunnel work alone, nearly all of their many tunnels, the longest of which is 1,600 feet, being worked from both ends, night and day in eight-hour shifts. The California Construction Company, which has the contract for the work, will complete it some time during the month of March next.

When these enterprises are carried through, and everything looks favorable now to their early completion, and with the Redlands Power Company's plant in operation, what more reasonable to expect than that the entire so-called kite-shaped track from Los Angeles through Pasadena, Azusa, N. Poniona, San Bernardino, Redlands, Riverside, Santa Ana and to Los Angeles again, comprising 150 miles of heavy steel track, be "electrized?" There has been more than one conference between the leading spirits of the Power company and the Santa Fe officials on this subject.

G. W. T.

Azusa, Cal., August 30.

Notice of appeal from the decision of Judge McLennan in the case of the city of Utica, N. Y., against the Utica Telephone Company has been filed by the attorney for the defendant. Some time since Judge McLennan granted an injunction restraining the Utica Telephone Company from doing business in the streets of the city, and August 20, in Syracuse, denied a motion to vacate that injunction. He ordered, however, that the defendant be allowed 10 days to proceed with a reference. The defendant refused the reference and decided to appeal from the decision. Meantime the injunction stands.

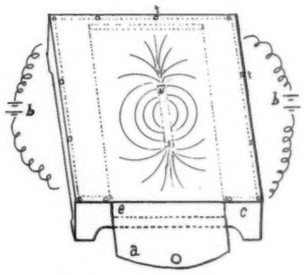
Lines of Force Illustrated.

TO THE EDITOR OF ELECTRICAL REVIEW:

There are many methods of presenting to the eye the phenomena produced by electro-dynamic lines of force. One method as used and described by Prof. J. W. Moore consists of a glass plate resting on posts, the magnets lying under this plate or projecting through holes made in the glass plate. Iron filings placed on this glass will arrange themselves in obedience to the lines of force produced by a magnet placed underneath. A suitable light and a reflector can be used to throw the image of the figure upon a screen to be viewed by an audience.

A cheaper and more easily constructed appliance as designed and used by the writer is described below.

Make a square frame of dry wood of the form shown in the accompanying drawing. The slot *e* is made for the purpose of inserting a glass or wooden shelf *a*. This shelf is movable. On top of this wooden frame



LINES OF FORCE ILLUSTRATED.

a sheet of cardboard is secured by means of thumb tacks *t*, as shown.

Magnets of various forms and sizes are placed upon the slide shelf and the shelf inserted in place. It can be blocked up with wedges to bring the magnets nearer the cardboard, if so desired. Iron filings are then sifted on the sheet of paper. Gently tap the cardboard (vertical blows) till the filings arrange themselves to suit.

Instead of using a magnet, coils of wire carrying a current can be used, or two coils can be used to show the effect of two adjoining fields of force. Or a magnet and a coil can be used together. Then, again, a hole can be made in the cardboard and a magnet placed vertically through the hole. Two holes can be made and a coil of wire threaded through the holes so as to bring the plane of the coil vertical, half on one side of the cardboard and half on the other. Any number of combinations can be made to suit the experimenter. Two sets of batteries are used, one on either side, to connect with the coils, etc. If the slide shelf be removed, the magnets can be placed vertically underneath the cardboard.

The special feature of my apparatus is the method of preserving the figures produced by the lines of force for future use and comparison. It is as follows: After a figure has been made to suit, take a piece of wire screen about three inches by four inches, and a toothbrush, dipping the brush in ink, brush the screen while held over the figure. This will cause a shower of very small particles of ink to fall upon the cardboard. Use special care not to use too much ink at a time, as that will cause large drops of ink to fall on the paper. Allow the ink to dry *thoroughly*. Now remove the magnet and brush off the filings. The result is a dark background with a white picture of the lines made by the filings. By using care very beautiful pictures can be made, and the spatter-work adds to the effect.

If the operator be so fortunate as to own an artist's air-brush, he can produce pictures that are really a work of art, and at the same time instructive.

The sheets of cardboard can be bound to form a neat book for reference, the description of the apparatus used being written at the bottom of each sheet and the pages numbered. Both sides of the cardboard can be used.

O. H. PACKER, M. E.

Junction, Nev.

IMPROVEMENT IN BUSINESS.

A FEW BRIEF BUT TELLING EXTRACTS FROM LETTERS RECEIVED AT THIS OFFICE.

"SHIPMENTS ALL OVER THE COUNTRY."

TO THE EDITOR OF ELECTRICAL REVIEW:

Business is good with us and we are making shipments all over this country and to several foreign countries.

New Haven Car Register Company.

JAMES C. BRADLEY, Secretary.

New Haven, Ct., September 4.

"OUTLOOK VERY PROMISING."

TO THE EDITOR OF ELECTRICAL REVIEW:

We are pleased to report that the outlook for business is very promising, and we note already a marked improvement in conditions.

PARTRICK & CARTER COMPANY.

Philadelphia, September 4.

"BETTER FEELING IN BUSINESS."

TO THE EDITOR OF ELECTRICAL REVIEW:

There is a somewhat better feeling in our business than there has been in the past three or four months.

Very respectfully yours,

CHAS. A. SCHIEREN & CO.

New York, September 3.

West End Road Leased to the Boston Elevated Railway.

At a special meeting of the stockholders of the West End Street Railway Company, held in Boston on September 9, the lease of the company to the Boston Elevated Railway was ratified by a vote of 179,668 shares. There are 181,700 shares of common stock and 128,000 of preferred outstanding. But 409 shares voted "No." The stockholders of the Boston Elevated Railway Company met the same day and unanimously approved the lease of the West End Street Railway. All the stock was represented. The Boston Elevated Railway Company has deposited $300,000 with the State treasurer.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication on the following week.

NEW YORK, SEPT. 15, 1897.

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An electrician has sued a manufacturer of X-ray apparatus in Cincinnati for damages because the X-ray outfit supplied to him was, as he alleges, defective and worthless. This is the first case of the kind on record.

A number of new switchboards for telephone exchange work are soon to be placed on the market, and it is thought that many new features are involved in some of this apparatus which will be an aid to the independent telephone world. One of these boards is being perfected by a Boston company of telephone engineers, one by a New York manufacturing company, and a third by a prominent Connecticut house.

THE FARMER AND THE TELEPHONE.

To a recent number of the *Illustrated American*, the Hon. Thomas B. Reed contributes a characteristic article on "Wealth and One of Its Results." While admitting that the subject of wealth is so vast in its comprehension as to require a large volume for its treatment, yet Mr. Reed in an admirable manner condenses into a few hundred words a splendid line of thought and argument on the one result of which he writes. This result is that through the natural progress of civilization, the acquirement of wealth, and the concentration of capital in industrial enterprises, the laboring hours of the working man have been materially reduced, thus leaving more time for intellectual development. Owing to the same causes, the means for this intellectual development are placed at his disposal at such a trifling cost as to render it almost impossible to ignore or neglect them. The means of development referred to are books of all kinds, which are now produced at so low a price and of such good quality as to be within the reach of every one. The author compares Crœsus with the modern millionaire in this respect, that Crœsus with all his wealth could not have produced a single pound of paper, while the modern millionaire can produce thousands of books, at a price which renders them available to the masses, and still have a large part of his fortune left for himself.

A line of argument similar to Mr. Reed's could be advanced in connection with the rapidly growing use of the telephone. A few years ago the telephone was regarded as a luxury to be enjoyed only by the rich, or as an article of necessity which the economies of business required to be used. The poor man or the man of moderate means was apparently not considered in the problem at all. And yet the progress of civilization—which, of course, includes the progress of science and invention—and the concentration of capital in the development of the telephone business, considered as a whole, have resulted in the fact that to-day the telephone is in almost universal use, and in the majority of our cities and towns is already within the reach of the poor man. To be sure, the telephone problem has not as yet been carried out to the extent that Mr. Reed proves in the matter of books, but the ultimate result is fast approaching. To-day there is scarcely a town in the United States of any size that is not provided with its local telephone exchange. In many cases the competition between the Bell company and the independent telephone interests has resulted in ridiculously low rates to the subscriber. As showing the progress of the use of the telephone, it may be stated that the number of subscribers in New York city alone has more than doubled in the past decade, and there are now nearly 20,000 telephone stations in the metropolis.

But it is not in the large cities that the poor man is to reap the greatest benefit from the telephone. Those in isolated communities, such as farmers in the great West and South, will find much to relieve the monotony of their lives in the constantly extending use and decreasing cost of the telephone.

The ELECTRICAL REVIEW has chronicled from time to time the establishment of telephone connection between isolated points in the West by using barbed wire fence as the telephone line. Several of these telephone systems are now in successful operation, with the advantage of a very low cost of installation and an extremely low maintenance charge. We, in the large cities, can scarcely realize what it means to the family of a farmer, especially the female members, who have always been cut off from frequent communication with their neighbors, to be able to now enjoy telephonic connection with them. Great sociologists have pronounced isolation the chief bane of the farmer's life. To a certain extent, in the United States at least, this has already been overcome by means of the telephone, and the era is but beginning. Laying aside the question of business convenience, the telephone for social reasons alone will prove itself to be a wonderful benefactor to rural communities, and chiefly for the same reasons outlined in Mr. Reed's able article.

At the British Association meeting in Toronto the exhibition of one of Tesla's oscillators, to which we referred in a previous issue, called forth an interesting discussion, which was opened by Lord Kelvin and joined by Dr. Oliver Lodge, Professors Sylvanus P. Thompson, G. P. Fitzgerald, W. E. Ayrton and other scientific men here and abroad. All present manifested great interest in the principle underlying the instrument, which was pronounced entirely novel. Lord Kelvin's remarks were particularly kind and appreciative. He stated, among other things, that the oscillator was a "wonderful development of the induction coil and was destined to be of great importance." The instrument was shown in operation by Professor McLennan, of the Toronto University.

In his brief paper, which was read by Professor McLennan, Tesla stated that the instrument exhibited was capable of covering a surface of over four square feet with luminous streams, involving during the performance an expenditure of energy of less than 35 watts, and that by the use of the described principle a stream of sparks 12 inches in length is obtained, the energy consumed being less than 10 watts!

ELECTRICAL CONVENTIONS.

FOUR IMPORTANT ELECTRICAL GATHERINGS THIS WEEK.

Niagara Falls, N. Y., is honored this week with two electrical conventions, and Nashville, Tenn., with a similar number. At the former city convenes the Association of Edison Illuminating Companies and the New York State Street Railway Association; at Nashville is being held the first annual convention of the International Association of Fire and Police Telegraph Superintendents, a partial report of whose proceedings is presented in this issue; and, in the same city, the Old Time Telegraphers' Association and United States Military Telegraph Corps meet together.

The countenances of three of the presidents of these associations are reproduced on this page of the ELECTRICAL REVIEW. These gentlemen have, one and all, labored zealously for the advancement and usefulness of their organizations and the meetings promise to be particularly interesting and well attended. Full reports of the proceedings will appear in subsequent issues of this journal.

MR. SAMUEL INSULL, OF CHICAGO, PRESIDENT ASSOCIATION OF EDISON ILLUMINATING COMPANIES.

MR. G. TRACY ROGERS, OF BINGHAMTON, N. Y., PRESIDENT STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

MR. FRANK C. MASON, OF BROOKLYN, N. Y., PRESIDENT INTERNATIONAL ASSOCIATION OF FIRE AND POLICE TELEGRAPH SUPERINTENDENTS.

Y. M. C. A. Electrical Courses.

The Twenty-third Street Branch of the Y. M. C. A., of New York city, will open its winter course of electricity the first week in October. It will again be in charge of Mr. Max Osterberg, E. E., A. M., who has lectured there for several years. This year the course will be extended considerably, being divided into two distinct sections, one elementary course starting with the principles of electricity, and one advanced course intended principally for stationary engineers, wiremen and electrical workers, in which the engineering principles of lighting, railway and power transmission will be discussed. Mr. Osterberg will visit a number of interesting installations with his students to give them object lessons of actual practice. It is also intended to open a course in physics and mechanics if a sufficient number of applicants can be secured. Applicants can get detailed information by applying to Mr. Cox, educational secretary of the Branch, 52 East Twenty-third street, New York city.

PERSONAL.

Mr. Geo. T. Manson, general superintendent of the Okonite Company, is attending the electrical conventions at Niagara Falls this week.

Mr. A. J. Cassatt has been unanimously elected a director of the Union Traction Company, of Philadelphia, to succeed Mr. Caleb F. Fox, recently resigned.

A special car load of street railway men, under the chaperonage of Major H. C. Evans, of the Johnson Company, left New York on the Erie Railroad Monday evening, for Niagara Falls.

Mr. J. C. Chamberlain, manager of the Electric Launch Company, Morris Heights, New York city, is enjoying a brief vacation, accompanied by his wife, among the Thousand Islands.

Mr. H. L. Shippy, secretary of the John A. Roebling's Sons Company, is attending the electrical conventions at Niagara Falls this week. He left New York on the Empire State Express Monday.

Mr. J. C. Reilly, general superintendent of the New York & New Jersey Telephone Company, sailed for Rotterdam last week. Mr. Reilly, who has been ill for several weeks, is taking the voyage for his health.

Mr. E. W. Rice, Jr., of the General Electric Company, is stopping at the Waldorf, New York city. Mrs. Rice, who has been quite seriously ill, is now improving in health, although it will be several days before she will be able to leave the hotel.

Secretary W. S. Barstow and Messrs. John W. Howell and Luther Stieringer, of the Edison Association, went to Niagara Falls in advance of the convention to see that everything was in readiness for the electrical visitors. Their headquarters are at the Cataract House.

Mr. James F. Cummings, president of the Armorite Interior Conduit Company, of Pittsburgh, spent several days recently in New York on business connected with the eastern office of the company, which is in charge of Mr. R. B. Corey, 711 Havemeyer Building, New York.

The only people who do not believe that prosperity is here are those who will not be convinced.

Preventing X-Ray Burns.

Elsewhere in this issue of the ELECTRICAL REVIEW we publish a very interesting communication from Mr. Elliott Woods, of Washington, D. C., who is one of the most earnest X-ray experimenters, and whose previous communications to the ELECTRICAL REVIEW our readers are familiar with. Mr. Woods has found that a pasteboard screen covered with gold foil seems to neutralize the ill effects following a too long exposure to the X rays, resulting in what are now known as X-ray burns. He disclaims any originality in this discovery, stating that it is merely a modification of Tesla's aluminum screen method. Mr. Woods also asks his fellow experimenters to check his results. It is probable that there are a great many interesting problems to be worked out in connection with the use of leaf-metal screens of various kinds, and it will undoubtedly be through just such intelligent and earnest work as Mr. Woods is doing that many of these problems will be solved.

Troy City Railway Company.

The Troy, N. Y., City Railway Company has declared a quarterly dividend of one per cent payable September 10. This is the first dividend declared since December. The usual quarterly dividend previous to that was one and one-fourth per cent. The directors have decided to create a sinking fund with the other one-fourth per cent for the benefit of the $400,000 debenture bonds. The annual report shows: Gross, $501,977; Decrease, $16,798; net, $235,435; Decrease, $19,697. The company has now outstanding, besides the $2,000,000 bonds and $2,000,000 capital stock, $399,300 debentures against $380,300 the year before.

St. Louis Edison Company Sold.

The foreclosure sale of the property and plants of the Edison Illuminating Company, of St. Louis, was held on September 11. The interests represented by $8,000,000 in stocks and bonds were closed out to A. D. Brown of the reorganization committee for $914,000. The Missouri Edison Electric Company will be incorporated in a few days, with a capital stock of $4,000,000, to succeed the old concern.

Papers Read Before the New York State Street Railway Convention.

The following is a correct list of the papers read before the convention of the Street Railway Association of the State of New York, held at Niagara Falls this week:

"Storage Battery," Herbert Lloyd, Philadelphia, Pa.; "The Repair Shop," Robert Dunning, Buffalo; "Municipal Ownership," H. H. Vreeland, New York; "Facts and Fancies of Railroads," W. W. Cole, Elmira; "Low Joints. How to Prevent Them," C. L. Allen, Syracuse; "The Advantages of a Car Mileage Record," T. J. Nicholl, Rochester; "A Decade of Electric Railway Development," W. J. Clark, New York; "How Can We Increase the Efficiency of Employés?" W. W. Wheatley, Brooklyn; "Street-Car Wheels. Should They Be Made Heavier?" F. D. Russell, Rochester, N. Y.; "Truck Building. How Can We Obtain the Best Results?" H. S. Newton, Syracuse; "Construction and Maintenance of Car Bodies and Trucks," a representative of the Buffalo Street Railroad; "The Prevention of Accidents. The Best Method to Accomplish This End," H. S. Cooper, Schenectady; "Rails. Their Construction From a Scientific Standpoint. Results of Chemical Analysis," President Moxham, Johnson company, Lorain, Ohio; "Advantages of Up-to-date Street Railroad Service. Why the Rate of Fare Should Not Be Reduced," C. L. Rossiter, Brooklyn.

American Electric Heating Corporation's Car Heaters.

TO THE EDITOR OF ELECTRICAL REVIEW:

The recent decision on car heaters against the West End Street Railway, Boston, refers to some heaters furnished two years ago by the old organization of the American Electric Heating Corporation similar to those made by another company but totally unlike the American company's regular car heater, which was in no way involved in the suit.

The suit will be appealed, as is usual.

The patents under which the American company's heaters are made fully protect them and the users of them, and have never been called into question, and the American company report a record of complete satisfaction.

AMERICAN ELECTRIC HEATING CORPORATION,
JAS. I. AYER, General Manager.
Boston, September 11.

TELEPHONE NEWS AND COMMENT.

At $300 a share Bell stock would be a five per cent stock, as it now pays 15 per cent dividends.

John Spickerman, of Sidney, N.Y., expects to build a telephone exchange in Unadilla, N. Y., to connect with the present exchange in Sidney.

The Bell Telephone Company, of St. Clair, Mich., has announced a rate of 10 cents to Fort Huron and 20 cents to Detroit, to meet the rate of the new State telephone company.

The Board of Education of Alameda, Cal., is considering the advisability of putting in a telephone system of its own, connecting all the schools and the superintendent's office.

The New England Telephone and Telegraph Company, of Franklin, N. H., has reduced the rates of telephone service to $1 per month. The company also offers to give the free use of a telephone at the residence of every business man who is a subscriber for his office or place of business.

The Batesville, Tenn., Telephone Company has just completed 28 miles of new line to Evening Shade, Sharp County, making connections at Hickory Valley, Cave City, Dusock and Evening Shade. In the near future the line will be extended to Hardy, on the Kansas City & Memphis Railway.

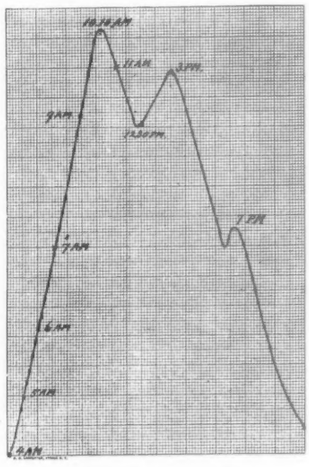
A telephone system has been introduced by the Post Office Department at Washington, D. C., by which all the chief officers are brought into communication with one another. There are now 32 telephones in the department, the operator and switchboard being in the office of the captain of the watch.

The wires and instruments are being put in at Franklin, Va., for a telephone exchange. A large number of subscribers is reported to have been secured. This exchange will be connected with Suffolk and Norfolk also. The entire system this side of Suffolk will be owned by the Southampton Telephone Company, which will connect with the Nansemond Telephone Company in Suffolk, and that in turn connect with the Southern States Telephone Company, of Norfolk.

The Central Telegraph Company, of Cleveland, Ohio, has been incorporated with $100,000 capital stock, by J. Howard Van Derveer, Edward A. Kline, Orion F. Thomas, Henry T. Pritchard and La Q. Rawson. They will operate a telegraph system through the counties of Mahoning, Trumbull, Portage, Geauga, Cuyahoga, Lorain, Erie, Sandusky, Ottawa, Wood, Lucas, Fulton and Williams, with termini at the eastern and western borders of the State, the eastern terminus to be at Lowellville, Mahoning County.

"Getting a Hump On."

Many of the readers of the ELECTRICAL REVIEW have heard of the telephone charts kept by the Chicago Telephone Company, showing the daily volume of business transacted, with all its variations, from the early morning hours to the busiest forenoon, but it will be news to many that this custom is the origin of the popular phrase, "getting a hump on," which is commonly used to indicate a special activity. But such is the fact, says General Manager Hibbard, according to Carl Smith, in the Chicago *Record*. The expression was born in the telephone office, and grew out of the custom of keeping the charts mentioned. Beginning at the lowest point of the telephone activity, which is about 4 A. M., the volume steadily springs upward to the busiest minute of the day, which is about 10.10 in the morning. From that high point of activity the use of



"GETTING A HUMP ON."

the telephone dwindles until in the noon hour it is down to a comparatively low mark. After that, and especially about three o'clock, the rush is resumed, swelling the volume to some such figure as that indicated in the picture. When the first of these charts was made to register a day's work, it was noticed that the line bowed upward into a hump at three o'clock, and this was from that time called the "three o'clock hump," because of the dromedarylike appearance it gives the map. The telephone people got to speaking of business getting a hump on it at three o'clock, and from the telephone office the expression went out into the city, and now in any line of traffic an especial rush causes the remark that trade is getting a hump on it. And when a man makes some extraordinary effort he, too, is said to be getting a hump on, without any one suspecting that he is deforming himself. There is also in the telephone business a seven o'clock hump, induced by the common use of 'phones in making evening engagements.

C. E. K.

The Central Pennsylvania Telephone Company will, in a few weeks, inaugurate a new system of tolls in Scranton, Pa. By the proposed arrangement every telephone call will cost 10 cents to the subscriber, who in turn may collect the amount from any "thank you, sir," who may use the 'phone.

THE EFFECT OF HEAT ON INSULATING MATERIALS.

READ AT THE FOURTEENTH GENERAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, ELIOT, ME., JULY 26–28, 1897, BY PUTNAM A. BATES AND WALTER C. BARNES.

A paper on this subject was presented before the American Institute of Electrical Engineers on May 20, 1896, by Messrs. Sever, Monell and Perry. In the discussion which followed the results were questioned by several members, and Mr. C. F. Scott cited some investigations of Mr. Skinner, who obtained curves which differed very considerably from those shown in the paper.

This left the subject in such an unsatisfactory condition that it was decided to make further tests, with the object of reconciling the differences or determining what the real facts are.

In our investigations more attention has been paid to the actions which take place when one kind of material is subjected to tests while the conditions are varied, rather than a great number of tests on different materials, under the same conditions.

In fact, it has been deemed wise to conduct all the tests on one kind of material, it being safe to conclude, from results previously obtained, that the action on it would be quite similar to that produced on other samples. Therefore, the ordinary "red fiber" insulating material, having the general appearance of thick red paper, has been selected. Its thickness is about .009 inch.

THE APPARATUS.

This consists of two distinct parts; viz., the device for heating and that for testing the insulation resistance. The heating apparatus consists of a single electric heater having a radiating surface of 47 square inches. This is nothing more than six resistance coils tightly packed with asbestos in a short sheet-iron cylinder, whose lower end is open. The terminals come from the ends of this set of resistance coils through the bottom of the heater, and are then connected through a suitable switch to a 110-volt circuit. This heater is supported on three porcelain insulators, which rest on a slab of slate one and one-half inches thick and one foot square. The heater takes exactly four amperes of current when all other resistance is cut out of the circuit.

Around the heater is placed an earthenware cylinder, one foot high and nine inches in diameter. This provides an excellent method of keeping the heat in, and together with the electric heater secures perfect regulation of temperature. The terminals of this heating circuit are brought directly down and out from the heater through the base slab of slate to the terminals of a 110-volt lighting circuit, and are thus kept entirely separate from any other part of the testing apparatus.

Resting on an asbestos collar, and at a height of about two inches above the heater, in the earthenware cylinder, is placed a circular iron plate one-eighth of an inch thick, which is one terminal of the testing circuit itself, and is connected to one binding-post of a Thomson high-resistance galvanometer, a standard megohm being placed in series between the two.

The insulating material to be tested is wrapped on an iron cylinder, three inches in length, and having an external diameter of .875 inch, the insulation not quite reaching to the ends of the cylinder. The insulation is then wound with No. 26 Brown & Sharpe bare copper wire. This winding makes the other terminal of the testing-circuit, and is connected to the other post of the galvanometer. The iron cylinder, upon which the insulation is placed, is then placed upright on the above-mentioned iron plate. Thus it will be seen that the insulating material now separates the copper wire winding, as one terminal, from the iron cylinder which is now in contact with the iron plate, as the other terminal. The leading-in connections to these terminals pass through small holes, bored in the earthenware cylinder. Glass insulators are used in these holes in order to prevent any current from creeping across from one wire to the other over the surface of the earthenware. Heavy covers of asbestos board are placed over the top of the earthenware cylinder, and this again is entirely covered with a large glass globe.

The potential used in this circuit is 500 volts. A suitable shunt, consisting of one or two turns of bare copper wire wound on each end of the sample of insulation, so situated that they would intercept and shunt past the galvanometer any current tending to leak along the surface of the insulation, from the iron cylinder to the winding—that is, from one terminal to the other—is used in order that a deflection of the galvanometer needle will be produced only when a current actually passes through the insulating material under test.

In making the apparatus we have been very particular to eliminate all metals, with the exception of iron and copper, thus avoiding any possibility of the volatilization of zinc, which was one of the points raised in regard to the previous tests.

This apparatus, when complete, works admirably, absolutely no difficulty being experienced with either the heating or the testing circuit.

The questions that we have attempted to answer by this investigation are four in number; viz.:

1. Does the presence of brass or other metals from which zinc may become volatilized, in the apparatus in which the test is conducted, affect the insulating material or its behavior?

2. Why should one experimenter obtain an insulation resistance curve for fiber, whose minimum point is at about the same temperature as the maximum point of an insulation curve obtained from similar material by another experimenter?

3. What effect on fiber insulating material is produced when it is subjected to conditions similar to those likely to occur in dynamo-electric machinery?

4. What is the action, or actions, that take place when fiber insulating material is repeatedly heated from 20 degrees centigrade to 200 degrees centigrade?

Question No. 1 has been approached in the following manner: The resistance of the insulating material at the temperature of the air, or 20 degrees centigrade being determined, the temperature is gradually raised until 209 degrees is reached, when the test is discontinued. The time taken for this rise was exactly two and one-half hours. Resistance measurements are made at frequent intervals, and from these curve No. 1 is plotted. The area of insulation tested being 5.5 square inches thickness = .0095 inch.

The position and shape of this curve agrees very closely with the results obtained by Messrs. Monell and Perry, who in their experiment used a brass cylinder, but a confirmatory test with a brass cylinder was also made in our apparatus. This experi-

ment was deferred until the completion of all other experiments.

Curve No. 2 thus obtained from a like sample of insulating material, thickness .0095 inch, area tested = 4.6 square inches, showed that the presence of brass in the apparatus does not affect the shape or position of the curve.

In taking up question No. 2, it is intended to prove, by comparative tests, that the position of the maxima and minima points of the resistance curves depends upon the opportunity of escape given to the moisture originally contained in the specimen.

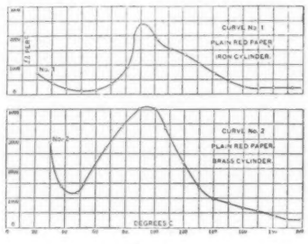


FIG. 1.

Curve No. 3 shows the results from a test on a sample of plain red fiber, thickness .009 inch, the area of insulation under test being 2.2 square inches. In this case five layers of No. 26 Brown & Sharpe bare copper wire were wound closely upon the fiber, the length of winding being only .8 inch.

Curve No. 4 has been obtained from a test on a specimen cut from same sample wrapped with a sheet of thin malleable iron, held firmly in place by a number of layers of tightly wound copper wire, thus approaching the conditions under which the experiments cited by Mr. Scott were made. The area covered by this iron wrapping is 6.75 square inches. This test consisted as before in gradually raising the temperature from that of the air to 200 degrees centigrade, the resistance being measured at frequent intervals. The curve obtained under the above conditions is almost identical with that published by Mr. Scott.

It is clear from these two experiments that the position of the curve may be shifted at pleasure by simply varying the opportunity for the

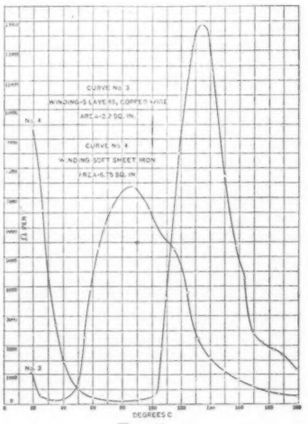


FIG. 2.

escape of the moisture originally contained in the insulating material. That is to say, if we wind our specimen with wire and only cover a small area, we find that the moisture has a much better chance of escape than if completely covered with an iron wrapping extending over a large area, and that the curve will actually take a position depending upon the rapidity of escape of the moisture. In the case of the wire-wound specimen the moisture escaped not only through the interstices between the wires, but also and to a much greater degree from the exposed ends which it reaches through the pores of the material; while with the iron-wrapped specimen the only chance of escape is from the exposed ends. Therefore, the greater the area covered the longer will be the path traversed by the moisture, and consequently a longer time or higher temperature will be required.

Question No. 3. A new specimen of plain red fiber .009 inch thick was wound with four layers of No. 26 Brown & Sharpe bare copper wire, the area covered being four square inches, and then subjected to the variations in temperature and exposure to moisture which are most likely to take place in dynamo-electric machinery.

Insulating material when used in this way is subjected to repeated heating and cooling, being kept at a moderately high temperature for varying lengths of time, also being exposed more or less to the moisture in the air. Therefore, the following eight tests have been made under conditions approximating the above and upon the above-described specimen.

In all of these tests the temperature is gradually raised from that of the air, 20 degrees centigrade to 80 degrees centigrade, at which temperature it is kept constant for three and one-half hours. The time taken to raise the temperature this amount is about 45 minutes.

Curve No. 5 has been obtained from the first heating. The specimen was then allowed to stand unexposed to moisture for 16 hours, at the end of which time a like test is made, giving curve No. 6. After a lapse of 24 hours, during which time the specimen was exposed to the atmosphere, which was very damp, the temperature is again gradually raised and kept constant as before, curve No. 7 resulting.

It will be seen by examination of these curves that the specimen after exposure to moisture returns to its original condition. The method of exposing the specimen to moisture is to remove the glass globe from the apparatus and the asbestos covers from the top of the earthenware cylinder, the specimen itself being undisturbed. Three days(72 hours) having elapsed, the specimen being undisturbed and unexposed to the atmosphere, is subjected to further test, giving curve No. 8.

Great care is now taken to protect the specimen from all moisture for 16 hours; at the end of which time, upon again testing, curve No. 9 is obtained. The test consisted, as before, in raising the temperature to 80 degrees centigrade, where it was kept constant for three and one-half hours.

All covering is now removed and the specimen allowed to cool to 23.3 degrees centigrade, the time occupied being three and three-quarter hours. Curve No. 10 is then obtained upon reheating.

Again great care is taken to protect the specimen from disturbance and all moisture for 19 hours. On being again subjected to test, curve No. 11 results.

Now the specimen is allowed to stand for exactly five days freely exposed to the moisture of the atmosphere, it being situated in a room near a window which is left open a considerable portion of the time, thus subjecting the specimen to conditions of atmosphere similar to those occurring in a station or factory.

The weather during the five days was unusually damp. A number of severe rain storms occurred, thus giving the specimen an extremely good opportunity to absorb moisture. At the end of this time a test was made, from which curve No. 12 was derived.

The object of this test is to see if, after exposure to moisture, the material will return to its original condition. By a glance at the curve thus obtained it will be seen that this actually takes place.

Let us now compare the eight curves. Curve 5 represents the original resistance variation of the material. Curve 6 shows the increased initial resistance on cooling, the specimen having been protected from moisture in the meantime. Curve 7 shows the return to the original condition on absorption of moisture; curve 8 the higher value of the resistance curve when the specimen

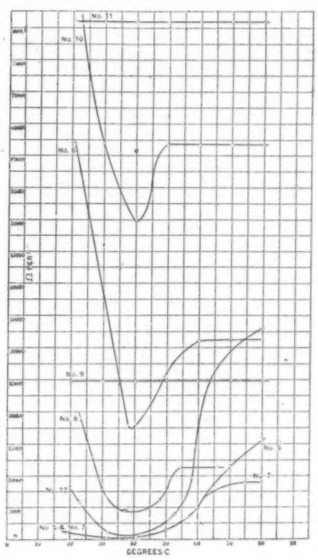


FIG. 3.

has been kept at 80 degrees centigrade for three and one-half hours and then allowed to cool, but not exposed to moisture. Curve 9 shows that the heating up to 80 degrees centigrade has practically no effect on the resistance after the moisture has been driven out and not allowed to return. Curve 10 shows the condition into which the specimen was thrown when cooled while exposed to the atmosphere. Curve 11 indicates that the moisture had again been practically all expelled and, therefore, the heat produced no change in the resistance. Curve 12 shows that the specimen, having been freely exposed to moisture, has returned to almost its original condition. In all these tests the resistance remained constant during the entire time that the temperature was kept constant. On examination the specimen was found to be practically unchanged in appearance, mechanical strength or other qualities. One might therefore conclude, on inspection of the various curves in connection with these experiments, that the action which takes place in a fiber insulating material, when heated up to about 80 degrees centigrade, merely depends upon the amount of moisture contained in the material at the time at which each measurement is made.

Question No. 4 may be answered by reference to the curves obtained from the three tests on one piece of insulating material wound with four layers of No. 26 Brown & Sharpe bare copper wire. Area of insulation under test was 4.125 square inches, and the thickness was .009 inch.

Curve 13 is the resistance curve for the first heating from 20 degrees centigrade to 200 degrees centigrade. The descending portion of the curve between 23 degrees centigrade and 40 degrees centigrade is probably due to the coalescing of the moisture within the material; that portion between 40 degrees centigrade and 80 degrees centigrade shows the rise in resistance, due to the expulsion of the moisture, and the remainder the negative resistance coefficient which insulators usually possess.

This test being completed, the specimen was allowed to stand undisturbed and protected from moisture for 24 hours. Upon reheating, curve 14 was then obtained. This shows the rapid drop from the enormous resistance acquired by the material on cooling from the previous test.

While the specimen was cooling from the heat applied in test 14, frequent measurements were made, resulting in curve 14*a*, which shows the rise to a still higher resistance than before. At 100 degrees centigrade the resistance was too great to be measured by the apparatus at hand.

Now the specimen was allowed to stand undisturbed for 36 hours, during which time the air in the apparatus was kept moist. Curve 15 was then obtained on repetition of the test, showing that the material when repeatedly heated to 200 degrees centigrade still retains its property of absorbing moisture, and the effect upon its insulation resistance is not as great as would be expected. But it should be noted that this high temperature of 200 degrees centigrade greatly injures the mechanical strength of the insulating material.

From the foregoing we may derive the following general conclusions:

a. The presence of brass in the apparatus does not affect the shape and position of the curve.

b. The difference in the curves depends solely upon the amount of moisture contained in the material and its opportunity of escape.

c. Every time the specimen cools the resistance increases to a value much above any resistance that it possessed before, provided it is kept from absorbing moisture.

It is impossible to determine the limit of this action with the present apparatus. But all the curves, particularly Nos. 5 to 13, clearly show this stepping-up effect, which is practically the same as the well known result obtained by baking insulating materials.

The Rise in the Stock of the American Bell Telephone.

American Bell Telephone's rise to 270 suggests the query, says the Boston *Herald*, whether the great price of 299 in 1883 is to be eclipsed.

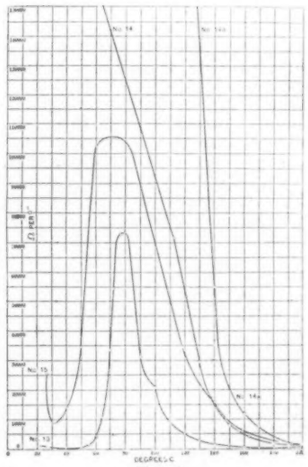


FIG. 4.

Chicago telephone stock is 217 bid, and the American Bell company is believed to have half of that company's capital in its treasury, and the half or more of every one of its local telephone companies in the country. The dividends on these stocks are rising and the shares and the stock of the parent company must be earning tremendously.

THE PRECISION OF ELECTRICAL ENGINEERING.

INAUGURAL ADDRESS OF THE PRESIDENT, AT THE 14TH GENERAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, ELIOT, ME., JULY 26, 1897, BY FRANCIS B. CROCKER.

(Continued from page 111.)

The directness and high efficiency with which electrical energy can be converted into other forms is another fact which gives exactness to our work. It can be transformed into heat, light, magnetic, mechanical or chemical energy, by the simplest means, and conversely, the latter forms, with the possible exception of light, can be readily changed into electrical energy. In most cases the conversion is almost perfect, the efficiency of an electric motor or dynamo being usually over 90 per cent, and often 93 or 94 per cent. The chemical energy in a storage battery represents nearly 90 per cent of the watt-hours applied to it, assuming the losses in charging and discharging to be about equal. The storage of magnetic energy may be effected at an even higher efficiency of 97 or 98 per cent, and the conversion of electrical energy into heat is complete, the efficiency of an electric stove actually reaching the ideal figure of 100 per cent. The production of light can not be accomplished so economically, nevertheless the arc lamp has a far higher efficiency than any other source of artificial light, although it is usually stated to be only eight or 10 per cent. It is also more than probable that the long-sought-for high efficiency lamp will be an electric one when it is finally invented. This facility and economy of transformation puts electricity directly in touch with the other sciences and their applications, avoiding the chances for error which roundabout processes necessarily involve. None of the other forms of energy possesses anything like the same convertibility. The one serious difficulty in connection with electricity is the fact that its generation requires a boiler, engine and dynamo, bringing in heat and mechanical power as steps in the process. If this complication could be avoided, and electrical energy produced directly from the chemical energy of the coal, the only limitation would be removed. This has already been done in an experimental way, and by the substitution of water-power for steam, one piece of apparatus and one form of energy are eliminated, but the complete independence of electrical engineering and the realization of all of its possibilities will be secured when the direct conversion of fuel energy into electrical energy is accomplished practically.

It has been shown that there are no less than eight substantial grounds upon which the precision of electrical engineering is based. The consideration of these has incidentally brought out several concrete examples, but it will be well to cite a few other special instances which demonstrate electrical exactness.

The one which first claims our attention, not only on account of its historical precedence, but also from its wonder-compelling results, is the locating of faults in ocean cables. In this connection I quote from information kindly furnished me by one of the vice-presidents of the Institute, Mr. A. E. Kennelly, who has had a long and successful experience in this branch of the profession. He states that "In the case of cable coiled in a tank, and which has been taken into the tank over a measuring drum without being subjected to any considerable tension, the precision with which a fault in the gutta-percha can be located is sometimes very considerable. I have known one or two cases in which a fault has occurred in a length of, say, 30 miles of cable immersed in water and maintained at practically one temperature in the tank, and in which, by means of the Varley loop test repeated many times and under various conditions to eliminate constant errors, the electrical position of the fault has been determined to within a probable error, representing about 20 feet of length. On turning the cable over from one tank to another by a seven-foot drum on which the cable makes three turns, and cutting the cable when the computed distance has been run over, the fault has been found on the drum; that is, in the 60 feet or so of cable then lying on the drum."

"As regards the location of faults in submarine cables on the ocean bed, the precision depends upon a variety of circumstances, and, in general, is necessarily much lower than in the case of a cable coiled in a tank. The average error in practice, or the difference between the true electrical and computed positions, is perhaps about 15 ohms, or about one mile and a half of cable having the common resistance of 10 ohms per mile. Under favorable circumstances a complete break in a cable developing a fair extent of surface exposure to the sea water at the end of the copper conductor, the electrical position can be determined within five ohms in a total conductor resistance of 1,000 ohms. In the case of a fault in the insulator, sufficiently serious to interfere with signaling, specially favorable cases will occur in which the electrical position of the fault can be determined to within one ohm, when a loop test is obtainable, and when the total conductor resistance of the loop does not exceed 3,000 ohms." "I have known a case of total loss of continuity in the conductor, accompanied by perfect insulation. It occurred in lifting a cable for repairs, and was within half a mile of the ship. A measurement of electrostatic capacity enabled the distance to be determined within a few yards." Other cases are given by Mr. Kennelly, and many may be found in various works and journals, but these are sufficient to show the astonishing results that are possible, as well as those that are obtained in regular practice.

The methods employed in locating faults in underground conductors are quite similar to those used for submarine cables, but the results are less striking and important. Mr. William Maver, Jr., who is an authority on this subject, cites a case in which the calculated position of a fault was 2,343 feet from the testing end of an underground cable 4,200 feet long. The defect was found at the exact point indicated. The alternative would have been the tearing up of the street and cutting through a heavy iron pipe until the fault was found, as the conduit was not provided with manholes. One way to locate a ground connection, which illustrates the simplicity and certainty of electrical testing, consists in sending a current through the conductor to the ground through the fault in the insulation. A compass carried along over the cable will indicate by its deflection or non-deflection when the fault is reached. The facility of overcoming distances and obstacles impassable to other agencies is characteristic of electricity and magnetism.

The writer has had occasion to test the resistance and position of faults ("grounds") on a very large system of underground conductors for electric lighting. Although the problem was complicated by the fact that it was a three-wire system which extended several miles, it was found possible to determine the insulation resistance of each of the three conductors. The position of a "ground" is shown by the potential difference between the conductor and the earth, being a minimum at that point. For example, if a ground connection exists on the positive wire and a considerable current flows through it into the earth, the potential of the earth at that point will be raised above its normal value. The potential difference existing between the wire and the earth is actually less near the ground connection. This may be measured from the station by using the "pressure wires" ordinarily laid with the feeders and special wires which connect to the ground at various points of the system.

[To be concluded.]

Tackled the Wrong Twin.

Frederick and Oliver Simmons, of West Hoboken, N. J., are twins, and resemble each other so strongly that their intimate friends hardly know which is which when they are apart, says the New York *Sun*. They are both employed as conductors on the Jersey City, Hoboken & Rutherford trolley line. Charles Singerwald, who had a quarrel with Fred, lay in wait for him last Wednesday night. A car came along with Fred, as Singerwald supposed, on the rear platform. Singerwald attacked him, but soon discovered that he had made a mistake in more ways than one.

The conductor was Oliver, and as he is something of an athlete and handy with his fists, Singerwald got a couple of black eyes and was pitched headlong from the platform. He smashed one of the car windows with a big stone which he threw at Oliver. Discovering in some way that he had mistaken his man, Singerwald went in search of Fred and found him to his subsequent sorrow. He got another thrashing and was locked up. He was arraigned in court in Jersey City and was fined $10 and costs.

A New Chicago Engineering Firm.

We have received the announcement of Meysenburg & Badt, Incorporated, of Chicago, a firm that will have its headquarters in the Monadnock Block. The announcement states that they are brokers, contractors and engineers in railway and electric equipment, appliances and construction; also experts in patent causes, and consulting engineers. Prof. Francis B. Badt, the widely known electrical engineer, is president of the company, and Mr. Edward A. Meysenburg is the secretary and treasurer. Mr. Meysenburg is prominent in financial circles in Chicago, and Professor Badt, who for several years has been the secretary of the Siemens & Halske Electric Company, is one of our ablest electrical engineers. The ELECTRICAL REVIEW extends its hearty best wishes for a well rounded success, which will no doubt greet this new firm.

Erie Telephone at 75.

The management of the Erie Telephone and Telegraph Company are receiving well earned congratulations on the advance of their security to its highest point; namely, 75.

Vice-President Glidden stated to a Lowell, Mass., *Mail* reporter that the rise was purely upon the merits and the excellent showing.

"Erie is not a manipulated stock, moves along a little slower than the other securities, but is gaining all the time, and I see no reason why the advance should not be maintained, subject, of course, to occasional reactions. It was only a short time ago that we said Erie would sell at 75, and now we look forward to see Erie sell at 80, and it may seem a little optimistic when I say that Erie will be worth 100 before many months have elapsed. There is no end to the demand for telephone service and we can not begin to keep up with it. One of our superintendents, writing under date of September 1, said: 'While it is true we have increased the facilities 50 per cent, the business has increased 100 to 150 per cent.' This means a very handsome increase of earnings.

"Summed up, we have two large resources to draw from: First, the large increase of population in the Northwest, Southwest and middle West, where our property is located. Second, the continued education of the people to the use of the telephone. The telephone has been with us now 20 years, and I fail to find the record of any of the Bell interests becoming embarrassed. There is not a company in existence but what has paid its stockholders a satisfactory dividend. We have no fears whatever from competition. 'The telephone business must be done by one company in any one community.' The people want the best service, and to talk with the greatest number of people. While there have been many idle 'bricks' around manufacturing property during the past few years, we have never heard of an idle 'insulator' or a 'dead' wire. Isn't this quite remarkable for a career of 20 years, and considering the panics we have gone through?

"Hard times may check the growth of the telephone, but never until the population begins to decrease will the telephone business diminish. Nothing has been more gratifying to me than to see the New England telephone sell at 125 and Erie at 75. One hundred and twenty-five looks rather a high mark for Erie to attain, but, with the growing West, I would not be surprised to see Erie within a few years pass its esteemed rival, the New England."

American Street Railway Association.

The applications for exhibition space at the October convention of this association are far in excess of the capacity of the hall, and it has been found necessary to scale down the space of large exhibitors. Efforts are now being made to secure more space, so that a larger number of exhibitors may be accommodated.

A side-track will be laid the entire front of the exhibition building for cars, sweepers, etc., as the doors of the building are not large enough to permit cars to enter. The Erie Railroad Company will construct a special switch and side-track free of charge. They request that all freight be shipped by that road if possible. They will switch all goods direct to the hall.

PROFITABLE EXTENSIONS OF ELECTRICITY SUPPLY STATIONS.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, NIAGARA FALLS, N. Y., JUNE, 18 7, BY ARTHUR WRIGHT.

(Continued from page 116.)

EXPLANATION OF TABLES AND CURVES.

As the knowledge of the profit-earning capacity of any electricity supply station so obviously depends upon the correct method of determining the cost of supplying electricity, the author thinks that the accompanying tables, relating to the development of a supply station in the fairly representative English town of Brighton, will be found interesting.

He trusts that the results shown in the tables will be all the more useful to central station managers generally, as the profit-earning capacities of both the small pioneering and the large permanent stations erected in that town have been amply proved, and from which an uninterrupted supply of electricity to the public has been given; the economical working of the two stations has also been generally acknowledged, and, lastly, the efforts there to get electricity generally used have succeeded in a remarkable way, as shown by the consumption per inhabitant at Brighton being far and away ahead of that in any other town in the United Kingdom; viz., 17 kilowatt hours consumed per inhabitant this year. The columns of the tables have been arranged in a form which will enable company managers to compare their results with the figures given.

The first small station was built on the usual pioneering lines adopted by many companies before security of franchise could be sufficiently assured to attempt capitalists to put much money in the concern, and the second on the modern lines of a permanent station possessing an absolutely secure franchise. As both concerns, in their respective years, were quite free from any promoter's paper capital, and always gave a supply whenever and wherever called upon to do so, the author sees no reason why the figures given should not form a basis for estimating the cost of supplying electricity under the most diverse conditions, by the necessary alterations being made in the cost of capital, coal, etc., and thereby enable any manager to find out the proper basis upon which to construct an equitable tariff for any particular town or condition of supply.

Columns have been inserted in the tables giving equitable charges that should have been made to the consumers during the different years on the two systems of charging advocated by the author, the first being based on the principle of charging the amount shown in Column 9, of Table I, per annum per maximum kilowatt demanded by each individual consumer, and then charging all the electricity consumed, quite irrespective of the purpose for which it has been used, at the rates given in Column 10 of the same table; and the other tariff, which is commonly known as the Brighton system, of charging a sufficiently high price per kilowatt hour consumed, until all the costs the company are put to in standing by have been covered; these figures being given in Columns 11, 12 and 13, respectively, of same table. The fact of this system having been adopted in about 30 English towns will convince the members of its commercial practicability.

On this tariff it is advisable to make the difference between the initial price and the reduced price as marked as possible.

In the preparation of the tables the author has employed the method of cost analysis by differences, explained at length in his paper before the London convention of the Municipal Electrical Association in 1896. In arriving at the total charges against the revenue accounts for the respective years, he has assumed that all stockholders would be quite willing to invest their money if five and one-half per cent on it were put aside out of revenue for the purposes of redemption and depreciation, and at the same time there was a reasonable chance of their getting another five per cent at least for the use of their money. He regards this as sufficiently liberal, as, so far as his knowledge goes, very few electricity companies set aside so large a percentage as five and one-half per cent on the whole of the capital for depreciation and repayment of capital, exclusive of dividends. With this provision the author has prepared the columns already referred to, showing what the tariff should have been to have produced this satisfactory result.

In a perfectly equitable system of charging, which, in the author's opinion, will generally be found synonymous with the soundest commercial tariff, it is obviously correct to make every one, whether using electricity for power or lighting purposes, pay the cost the company is put to in preparing the plant to supply the individual consumer's demand. Column 9, on Table I, is, therefore, given, showing the cost of so doing during the various years, and it is obviously inadvisable to look for a profit on this expenditure, or on the service rentals, but to make the whole of the net profit for dividend-paying purposes on the amount of the electricity actually consumed.

It must be understood that these tables have been prepared without making any arbitrary assumptions, and that the various amounts for running, standing-by and service rentals have been ascertained by the aforesaid method of differences and by a close analysis of the stations' cost sheets.

It will be seen from Column 5, Table III, that, at Brighton, where coal on the average costs about $5 a ton, delivered in front of the boilers, the cost of producing the electricity has always been very small compared with the cost of getting everything ready to supply.

The author need hardly remind company managers that, where coal is relatively cheaper or water-power is the source of energy, this proportionately large amount of standing-by costs will be still further increased.

It may be thought that all this great cost of putting the station in a position to run, compared with the cost of actually running the machinery, will practically disappear with a large extension of the motor supply business. This, in the author's opinion, is a complete fallacy, as the lighting load in any town will be very similar, however general the supply may become, and whether a constant day load is added to this or not makes no difference at all in the relative cost of supplying lamps one hour or, say, four hours. Until storage batteries become much cheaper than steam generating plants, the ratio of the standing costs to the running cost for lighting purposes will remain high.

As the standing charges of late years at Brighton have been found to rise nearly in proportion to the maximum annual load on the station, the author, in estimating the cost of supplying any consumer, debits him with an amount of the standing charges in proportion to his maximum call for current.

The author calls the members' particular attention to Column 4, Table V, showing the enormous increase in the sales per maximum kilowatt load on the station that has occurred since the sliding scale of charging was adopted at the beginning of the year 1893. From the column it will be noticed that this prolongation of the use of the plant has been no less than 54 per cent in four years, and it is perhaps needless for the author to point out what a great effect this has had in reducing the cost of production, as, with coal costing even the high price it does at Brighton, an improvement of the load factor of only three per cent has the same effect in reducing the total cost of producing electricity as if the coal bill had been reduced 15 per cent.

It will be noticed from the tables that the only items that were found to vary with the amount of electricity actually sold from a given plant were coal stores, water and repairs. Should any managers find that their wages or other costs vary also on this account, it is easy to separate these into standing-by and running costs by the above simple method of differences. Perhaps it may be well to remind those members who did not read the author's paper on the "Cost of Electricity Supply," in England, last year, that this method of analysis by differences is a means for determining the cost the station is put to in having to supply every additional kilowatt hour from its plant, and it consists in dividing the difference between the amounts debited in the six Winter and six Summer months, respectively, to the special account required to be so analyzed by the difference in the number of kilowatt hours sold in these two respective periods, the result giving a very correct estimate of the running cost per kilowatt hour during that year.

(To be concluded.)

TABLE I.—Showing development of business, proper charges for service rentals, standing-by, and for current consumption.

Type of station.	System.	Date.	Year of operation.	Annual sales of electricity. In K. W. hours.	Annual sales of electricity. In 50-watt lamp hours.	No. of house services at end of year.	Correct annual charge per service.	Correct annual charge for standing-by per consumer's maximum demand in K. W.	Correct charge per K. W. hour to pay cost of running and to make additional 5% on investment.	Inclusive charge per K. W. hour consumed on the average in one hour per day throughout the year.	Inclusive charge for supplying one 50-watt lamp one hour daily on average throughout the year.	Subsequent charge per lamp hour (including renewals).	Ratio of charge for first lamp hour to subsequent lamp hours (exclusive of lamp renewals).
1	2	3	4	5	6	7	8	9	10	11	12	13	14
							$	$	cents.	cents.	cents.	cents.	times.
PIONEER.....	Overhead wires, multiple series, H. T. continuous.....	1887	2	53,000	1,060,000	57	23.40	214	8.58	67.08	3.394	.469	7.8
Do	H. T. alternating, house transformer system.....	1888	3	75,000	1,500,000	86	14.86	170	8.8	55.3	2.805	.48	6.3
PERMANENT..	Buried conductors, two-wire L. T.	1892	1	156,041	3,120,820	212	14	82.1	9.755	32.37	1.664	.539	3.3
Do	storage bat. 1 500 amp.-hrs. capacity	1893	2	286,895	5,737,900	420	10.26	69.5	7 17	26.22	1.3505	.398	3.65
Do	Ditto, three-wire L. T. sliding scale.	1894	3	583 701	11,674,020	853	7.28	46	5.9	25.55	.9675	.335	4.34
Do	Ditto, with H. T. alternating sub-stations and L. T. distributors.....	1895	4	867,494	17,349,880	1,065	8.60	49.8	5.28	18.93	.9865	.304	3.58
Do	D tto	1896	5	1,388,821	27,776,420	1,366	7.68	50.4	4.06	17.86	.933	.243	4.4
	Ditto												

TABLE III.—Data for determining the correct charges.

Date.	Year of operation	Total annual standing-by charges per max. imum K.W. at station	Running costs per K. W. hour. Coal.	Stores and water.	Half repairs to machinery and plant.	Total.	Amount of profit on 5 per cent. additional interest on capital invested.	Daily cost per 50-watt lamp of standing-by.	Correct charge per lamp hour for continuing to supply (including lamp renewals).
		1	2	3	4	5	6	7	8
		$	cents.	cents.	cents.	cents.	$	cents.	cents.
1887	2	214	3	1.8	.48	5.3	1.735	2.925	.469
1888	3	189	3.3	1.32	.68	5.3	2.615	2.325	.48
1892	1	103	2.42	.09	.0368	2.546	11.265	1.125	.539
1893	2	94.25	1.416	.214	.0302	1.66	15.775	.9525	.398
1894	3	70.80	1.32	.324	.176	1.82	23.700	.6325	.335
1895	4	76.60	1.27	.162	.104	1.54	32.500	.6825	.304
1896	5	73.70	1.016	.118	.077	1.21	39.125	.690	.243

TABLE V—Showing lamps connected, maximum load, diversity factor and length of distributing mains.

Date.	Year of operation.	Equivalent No. of 16-C. P. lamps connected at end of year as applied for.	Diversity factor of the consumers as a whole.	Mean of the two years' station maximum loads in K. watts.	K. W. hours sold in the year per mean maximum K. watts.	Length of streets with distributing mains at end of year.
		1	2	3	4	5
						Miles.
1887	2	5,614	1	42	1,360	....
1888	3	8,880	1.11	73	1,025	....
1892	1	5.614	1.25	160	013	4.25
1893	2	9,880	1.36	287	1,000	9.5
1894	3	19,243	1.54	508	1,150	17.5
1895	4	25,032	1.54	740	1,170	19.75
1896	5	33,319	1.46	990	1,405	22.05

A Telephone Strike in Salem, Mass., Declared Off.

The strike of the men employed in laying telephone cables in Lafayette street, Salem, has been declared off. The men demanded a raise from $1.50 for 10 hours' work to $1.75 for nine hours. A compromise has been effected by which the men returned to work at $1.75 for 10 hours' work.

ADVANCE INFORMATION

Electric Light and Power.

HARRISBURG, PA.—Electric lights will be placed in the public building in this city. Contract has not yet been awarded.

SCRANTON, MISS.—C. M. Buckhalter & Company, of Birmingham, Ala., have been awarded contract for erecting waterworks and electric light plant for $20,836.

ATLANTA, GA.—The Mayor may be addressed concerning erection of an electric light plant, to be owned and operated by the city.

DUBLIN, GA.—The Mayor can give information concerning the extension of waterworks and electric light plant, for which $12,000 in bonds has been issued.

LOUISVILLE, KY. — An electric light plant is to be established in this city.

HUNTERSVILLE, N. C.—The Huntersville Improvement Board has been organized, with E. W. Savage, president; L. B. East, vice-president, and J. F. Cutchin, secretary, to consider a proposition to pave the streets, construct sewerage system and erect an electric light plant.

HOUSTON, TEX.—Frank Colby and others are preparing a petition to the City Council asking for the issuance of another $100,000 of bonds to invest in an electric light plant.

TERRELL, TEX.—The electric light plant owned by C. Vanordstrand, which was recently burned, will be rebuilt.

MADISON, Fla.—An electric light plant will be established at this place.

NORTH VERNON, IND.—The $15,000 electric light plant has been opened in this city.

WADSWORTH, NEV.—It is reported that an electric light plant is to be established here.

JACKSONVILLE, FLA.—Plans are being prepared for an addition to the city's electric light plant. It is proposed to build an extension 28 by 50 feet to the south end of the present building.

NORTH WALES, PA.—An electric light plant is being erected at this place.

SANBORN, IOWA—An electric light plant is to be established here.

JANESVILLE, WIS. — George L. Carrington is now the proprietor of an electric light plant at Albert Lea, Minn.

ST. PAUL, MINN.—The St. Paul Gas Light Company will furnish the light, heat and power for the court house and city hall and the county jail for the next three years.

ELYRIA, OHIO—The Elyria Gas and Electric Light Company has been incorporated, with a capital stock of $100,000.

PULLMAN, WASH.—Mr. W. J. Jackson is erecting an electric light plant at this place.

CRIPPLE CREEK, COLO.—A permit has been granted for a $3,000 addition to the present electric light plant. The addition will be used as a power-house for the new electric railroad.

BOSTON, MASS.—Work on the construction of the electric lighting plant for the city's lighting has been carried as far as Annisquam and will be rapidly pushed to the Rockport line.

ROCKAWAY BEACH, L. I.—The Board of Trustees of this village has awarded the contract for lighting the boulevard, railroad station and public grounds with electric arc lights to Van Wyke & Rossiter, of Brooklyn.

GLENS FALLS, N. Y.—The Indian River Company has been incorporated to develop water-power from the river. Capital stock, $125,000. Directors: Jeremiah W. Finch, William McEchron, William E. Spier and George R. Finch, of Glens Falls; Warren Curtis, of Palmer; John Derby, of Sandy Hill, and John C. Duncan, of Mechanicsville.

WASHINGTON, D. C.—The Secretary of the Treasury has awarded to the Pueblo Electric Company the contract for wiring the Pueblo public building.

SOUTH WHITLEY, IND.—A stock company has been formed at this place to put in an electric lighting plant.

ROMEO, MICH.—The people of this place have voted to build a $13,000 electric light plant, and work will begin at once.

NATICK, MASS.—Joseph Dews, the former owner of the Livingston Woolen Mills at East Greenwich, has announced that he will build a new electric lighting plant in the Pawtuxet Valley, and work will be commenced on the same in Washington village at once.

NEW BIRMINGHAM, ALA.—C. M. Burkhalter & Company, of this city, will begin on the 15th instant the construction of a waterworks and electric light plant at Scranton, Miss.

COFFEYVILLE, KAS.—The city is to have an electric light plant to cost $17,000. The city will vote bonds.

New Electric Railways.

PITTSFIELD, MASS.—The Pittsfield Electric Street Railway Company contemplates extending its lines into the southwest part of the town. The company will soon have in operation its 250-horse-power plant, which will be located in the new building of the Pittsfield Electric Company.

AMHERST, MASS.—The electric road in East Amherst will probably extend its tracks to George S. Thayer's store this Fall. The cost of the extension will be about $4,000.

PALMER, MASS.—The proposed electric road will be started in a few days.

EAU CLAIRE, WIS.—Work will commence shortly on the Chippewa Valley Electric Railway between Eau Claire and Chippewa Falls.

BATH, N. Y.—The Savona Valley & Lake Keuka Electric Railway has changed its prospective terminal station from Penn Yan to Dundee, as the citizens of the latter place manifest a more substantial enthusiasm than those of the former.

ANDERSON, IND. — Congressman Henry has secured a franchise through Alexandria, and announces he will build an electric railroad connecting gas belt cities. The first division will be from Anderson to Alexandria, immediately followed by lines to Marion, Elwood, Muncie and other points.

DETROIT, MICH.—Capitalists will build an electric road from this place to Romeo.

NEWTON, PA.—The contract for the building of the trolley road from this place to Langhorne has been given to G. W. Brubaker. It is expected that work will be started immediately, so as to have the road finished before cold weather.

SHENANDOAH, PA.—A trolley road is to be constructed from this place to Ringtown that will reduce the rail distance to Ringtown from 30 to four miles.

COXSACKIE, N. Y.—The Greene County Traction Company will construct an electric railroad from this place to a point about five miles in the country. This road will connect with four other electric roads which were incorporated a few weeks ago to operate in Greene, Schoharie and the lower portion of Albany County.

PHILADELPHIA, PA.—A movement is on foot to extend the trolley line from Plymouth Meeting to Ambler, a distance of about five miles. It would follow the Butler pike. At Harmonville connection would be made with the Schuylkill Valley line, and at Hickorytown with the Chestnut Hill line. An effort will be made to secure the right of way along the turnpike.

WICHITA, KAS.—The street railway system has been transferred to the Wichita Railway, Light and Power Company, and the directors of the new company elected the following officers: H. B. Church, of Boston, president; W. Q. Church, of Wichita, vice-president and general manager; A. C. Jobes, of Wichita, secretary and treasurer; R. R. Vermillion, of Wichita, attorney. The work of reconstruction will begin as soon as the material shall arrive.

HOUSTON, TEX.—The contract has been let for the building of the Galveston-Houston Electric Railway, which is to be operated between the two cities mentioned and intermediate stations. The length of the road will be 50 miles. Work is to be commenced October 15 and completed April 1. It will give additional transportation between the two largest cities of Texas, whose business interests are closely allied. There are now four steam roads being operated.

New Telephone and Telegraph Companies.

CHARLESTON, GA.—Arrangements are being made by the Bell Telephone Company to put in a long-distance 'phone between this place and Augusta. This connection will put Charleston in close communication with Atlanta, Macon, Mobile, Birmingham and Columbus, as Augusta has telephone connections with the above-named places.

NEW HUDSON, N. Y.—The new telephone line between this place and Cuba is completed.

NEW ALBANY, IND.—The line of the Ohio Valley Telephone Company has been completed between this city and Salem, and 'phones are being placed in the latter place.

BELOIT, KAS.—W. W. Dilworth, of this city, has secured the franchise for a telephone plant. It is on the automatic switchboard plan. He expects to have it in operation on or before November 1.

OAKESDALE, WASH.—A telephone line is to be erected at once from Oakesdale to Thornton, Sunset and St. John, and work will begin at once.

SILVERTON, COLO.—J. J. DeMarr will shortly finish the telephone line between this place and Eureka, being constructed for A. W. Helmboldt. There is some talk of having a line constructed to Gladstone by the Gold King and Red and Bonita people.

BRUIN, KY.—The Bruin and Leon telephone line is now ready for use. At this point it intersects with the line from Willard to Martinsburg.

VICKSBURG, LA.—A contract has been let for 20 miles of a long-distance telephone line from this city to Sartatia, in Yazoo County. Work begins next week.

MINNEAPOLIS, MINN.—The Northwestern Telephone Exchange at Minneapolis has opened its long-distance telephones. This will open communication with Chicago and New York. The wires are not connected with St. Paul, owing to the non-passage of pending ordinances.

WINFIELD, IOWA — Telephones and electric lights will probably be established here.

New Incorporations.

BIDDEFORD, ME.—Standard Electric Manufacturing Company has been organized for the purpose of doing a general manufacturing business in electric and other apparatus, with $10,000 capital stock. The officers are: President, B. Alden Prince, of Somerville, Mass.; treasurer, Harlie J. Savory, of Somerville, Mass.

Business Troubles.

MARION, IND.—Judge Brownlee has appointed James M. Bradford as receiver of the Indianapolis, Anderson & Marion Electric Railway Company, on the application of A. R. Smith and other creditors.

Increase of Capital.

ALBANY, N. Y.—The Amsterdam Electric Light, Heat and Power Company has increased its capital stock from $500,000 to $1,000,000. The liabilities of the company are $300,000.

Kindred.... ...Interests

The foreign business of the General Electric Company is increasing in many new directions since it secured the underground contract in London.

The Swett & Lewis Company, 11 Bromfield street, Boston, Mass., announce that they have greatly enlarged and improved their plant devoted to X-ray supplies. They are prepared to fill orders promptly.

The Philadelphia Gas Improvement Company, of Philadelphia, Pa., are increasing their plant by erecting a new fireproof pipe shop, constructed entirely of iron. The building has steel framework and a corrugated iron covering. The Berlin Iron Bridge Company, of East Berlin, Ct., are the builders.

The Gales Commutator Compound, manufactured solely by K. McLennan & Company, Chicago, is meeting with a very large sale since the reduction in price. The following is a recent indorsement:

> I am in receipt of your sample of Gale's Compound, and have tested it with remarkable results. We want more.
> NIAGARA FALLS ELECTRIC LIGHT AND POWER COMPANY, GEO. E. FOSTER, Superintendent.
> Niagara Falls, Ont.

Machado & Roller, 203 Broadway, New York, have just issued a very attractive little book describing the construction of the incandescent lamp, with illustrations of the large lamp factory of the Allgemeine Elektricitäts-Gesellschaft, Berlin. The booklet is gotten up with excellent taste, and contains an interesting review of the modern methods of incandescent lamp manufacture.

Mr. L. E. Frorup, who is associated with Mr. Ralph Straschnow as the New York representatives of Schiff, Jordan & Company, of Vienna, has recently returned from a six weeks' tour through England and the Continent. While abroad Mr. Frorup visited Vienna as the guest of Mr. Schiff, and spent some days studying the factory facilities relative to the product of carbons for the American market.

The Bickford & Francis Belting Company, Buffalo, N. Y., have recently issued a highly artistic pamphlet describing leather belting. It contains nearly 20 beautiful little halftone illustrations, showing the various processes of manufacturing belting, besides a very instructive essay on the work and use of belting in general. All belt users who write to General Manager Wilson of the company, 55 Exchange street, Buffalo, will receive a copy, and every belt user should write for it.

The A. L. Bogart Company has succeeded to the business carried on under the name of A. L. Bogart, at Union square, New York. Mr. A. L. Bogart died about a year ago, and the business passed into the hands of Mr. E. E. Bogart. Mr. E. E Bogart, as the readers of the ELECTRICAL REVIEW know, died some weeks' ago from injuries received early last Spring, and Mr. A. Livingston Bogart is president and general manager of the new company. The company changed from Union square to 50 East Twentieth street. Many valuable features of electric gas lighting are controlled by this company.

The Electric Appliance Company are well pleased with their experiment of carrying in stock in Chicago a line of porcelain, in all styles and sizes of knobs and tubes that will enable them to fill any order. The advantage of having this stock in Chicago instead of having to go to the factories for this material seems to be appreciated by the trade, and the Electric Appliance Company are reaping very satisfactory results. They are the Chicago depot for one of the largest porcelain works in the country, and are carrying a much larger and better assortment of stock of porcelain than has ever been carried in Chicago before, and a customer's requirements must be very severe indeed who can not satisfy his wants directly from the Electric Appliance Company's stock.

BIDS WANTED FOR ELECTRIC LIGHTING

ASHEVILLE, N. C., Aug. 12.

Bids for lighting our city are requested as follows:

For furnishing and maintaining one hundred to one hundred and fifty electric arc lights of two thousand (2,000) candle-power each.

The city reserves the right to reject any or all bids.

Bids to be received until September 20, 1897.

GEO. F. SCOTT,
Chairman Special Light Committee.

The Mayor and Gas Committee will receive bids to light the City of Waco, on an all-night and also on a moonlight schedule, with 125 to 200 arc lights, 2,000 c.-p., for a term of two to five years. We will also receive bids to install an electric light plant, specifications for which will be furnished by City Engineer on demand. All bids must be accompanied by a $1,000 certified check. We reserve the right to reject any or all bids. The bids will be opened by the Mayor and Gas Committee at 3 P. M., October 7th, 1897.

C. C. MCCULLOCH,
Mayor, Waco, Texas.

ATTEST:
R. W. JOBLONOWSKI,
City Secretary.

A NEW THROUGH PASSENGER ROUTE
FOR COLORADO, UTAH AND CALIFORNIA.

The Chicago *Times-Herald* of August 27 says that on September 12 the new traffic alliance between the Chicago, Milwaukee & St. Paul Railway and the Chicago, Rock Island & Pacific Railway goes into effect, and on that date the former will send its first Denver sleeper out of Chicago. This will be attached to its regular night train for Omaha, and will be delivered there to the Rock Island. On October 2 the tourist car route over these two lines, the Colorado Midland and Southern Pacific, will be inaugurated. Tourist cars will be run once a week between Chicago and San Francisco. For further details regarding this new route call on or address Geo. H. Heafford, general passenger and ticket agent, C., M. & St. P. Ry., 410 Old Colony Building, Chicago, Ill.

NOTICE TO BIDDERS.

Notice is hereby given that bids will be received by the Common Council of the City of Niagara Falls up to and including the first day of November, 1897, at 8 o'clock P. M., for the exclusive furnishing of electric arc lights to the City of Niagara Falls for a period of five years from November 1st, 1898, according to specifications on file with the City Clerk.

Each bid shall give the name and address of the bidder, and shall state the price per annum, for which the bidder will furnish each electric arc light of a two thousand (2,000) candle-lamp-power for said term.

The estimated number of arc lights to be furnished is three hundred (300), with the right of the Common Council of the said city to increase or decrease the said number as it may elect during said term.

The successful bidder will be required to enter into contract for the furnishing of said number of electric arc lights as may be required for such term at the price per annum named in his bid and to furnish bond in twenty thousand dollars ($20,000.00) for the faithful performance of said contract.

Each bidder must accompany his bid with a certified check for ten thousand dollars ($10,000.00) as a guarantee that he will enter into contract if the same is awarded to him.

Further information, if desired, will be furnished by the City Clerk upon application.

All bids shall be opened at the meeting of the Common Council, to be held Monday, November 1, 1897.

The Common Council reserves the right to reject any or all bids.

Dated August 16, 1897.

By order of the Common Council.
S. F. ARKUSH, *City Clerk.*

McCASKEY & HOLCOMB COMPANY,
CONTRACTORS
SPRINGFIELD, ILL.
415 COMMERCIAL BLDG., ST. LOUIS, MO.
We make a specialty of constructing Municipal Electric Lighting Plants.
Send for Estimates and Valuable Information.

ROYCE & MAREAN,
DEALERS IN
Electrical Supplies,
WASHINGTON, D. C.

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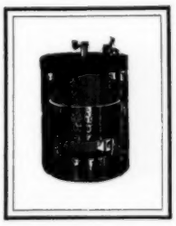

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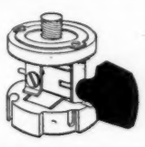
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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED SEPTEMBER 7, 1897.

589,412 Auxiliary electric contact; W. M. Brown, Johnstown, Pa.—A contact maker carried by an electrically propelled vehicle, a spring-pressed, knife-edged contact device in multiple therewith for contacting with the same side of the circuit, and means for retaining said device either in an operative position or in an inoperative.

589,429 Multiple series system of electrical distribution; C. D. Haskins, Brooklyn, N. Y.

589,430 System of electrical distribution; C. D. Haskins, Brooklyn, N. Y.

589,431 Telephonic measured service system; H. V. Hayes, Cambridge, Mass.

589,433 Starting box for electric motors; R. B. Hirst, Brooklyn, N. Y.—A resistance box and its lever, a switch controlling the main circuit, movable to closed position by said lever, a spring tending to open said switch, a retaining magnet adapted when excited to hold said switch closed, and means operated by said lever for breaking the circuit of said magnet to release said switch.

589,445 Electric hair singer; D. Seide, Hartford, Conn.

589,452 Traveling contact for electric railways; W. F. Weiss, Stockton, N. J.—A conductor and contact pole of an electric car, a grooved wheel adapted to revolve freely and contact at its upper periphery with the conductor, the means of carrying the said wheel at the end of the contact pole, the transverse rod adapted to support the said carrying means and to permit of lateral movement of the same upon it and the slotted cylinder as means for protecting the rod from contact with the conductor.

589,485 Electric rail bond; G. H. Scott, Worcester, Mass.

589,509 Electrical igniter for gas engines; E. R. Moffitt, San Francisco, Cal.

589,510 Watchman's electrical time recorder; C. H. Phinney, Boston, Mass.—An electrically actuated indicating apparatus, a plurality of circuit controlling devices electrically connected therewith and adapted to be moved when a like number of independent objects are placed in predetermined position, combined with a series of manually operable circuit changing devices, arranged in electrical circuit with and to operate said indicating apparatus, the operation of each of which is dependent upon a predetermined position of all of said circuit controlling devices.

589,543 Electric motor car; H. P. Brown, New York, N. Y.—A car and a motor for driving the same, a double reduction planet-gear friction-brake mechanism for communicating and reducing motion from the motor shaft to the axle of the car, said mechanism being provided with two friction-brake wheels and brakes, one of said brakes being mounted on the stationary frame and the other on a revolving part of the mechanism.

589,556 Transmission of energy by alternating currents; C. S. Bradley, Avon, N. Y.—As a means of transmitting periodic currents of uniform rate, a generator having a definite rate, a circuit containing a plurality of inductances in multiple arc, said inductances being proportioned to render the line resonant with the periodic electromotive force.

589,582 Electric switch; J. B. Smith, Manchester, N. H.—Slotted standards secured to a suitable base, spring actuated levers for opening and closing the circuit pivotally connected within the slots of said standards, said levers having a slot formed in their end at a right angle with their pivot.

589,618 Electric switch and cut-out for telephone boxes; A. C. Robbins, San Francisco, Cal.

589,619 Telephone transmitter for signal boxes; A. C. Robbins, San Francisco, Cal.

589,624 Underrunning trolley for electric railways; S. H. Short, Cleveland, Ohio.

589,669 Electric safety appliance for railroads; E. L. Orcutt, Somerville, Mass.—A track mechanism containing an open circuit, combined with a train mechanism containing a closed circuit looping in the open circuit on the track, and a resistance in the closed circuit on the train cut out by the looping in of the track circuit.

589,672 Electric meter; C. C. Schumacher, Chicago, Ill.—Consists of a recorder provided with a balance wheel, a pinion on said balance wheel, a toothed segment engaging said pinion, an armature connected with said segment, and a magnet for attracting said armature.

589,674 Alternating-current generator; F. H. Sleeper, St. Johnsbury, Vt.

589,726 Coin-operated telephone; F. Hoffman, Paragould, Ark.

589,742 Static machine; C. H. Meyers, South Bend, Ind.—A machine for generating static electricity, and a case inclosing such machine, with a tank in said case containing a refrigerant.

589,745 Device for indicating escape of gas; M. O'Donovan, Boston, Mass.

589,746 Electric signaling apparatus and circuit; E. H. Owen, Garvanza, Cal.

589,747 Annunciator system; E. H. Owen, Garvanza, Cal.

589,760 Electrical junction box; G. Trailleur, Chicago, Ill.—Consists of a series of conductors of different polarities entering said box, and a series of pole bars arranged within said box out of vertical alinement.

589,783 Dash electric headlight; J. Kirby, Jr., Dayton, O.

589,785 Surface-contact electric railway; L. H. Parker, Schenectady, N. Y.—A vehicle, magnets of opposite polarity located in advance and rear of the vehicle, shoes for each magnet making sliding contact with the rails, energizing coils for the magnets, a source of supply and a switch for simultaneously reversing the polarity of the magnets when it is desired to reverse the direction of movement of the vehicle.

589,786 Closed-conduit electric railway system; W. B. Potter, Schenectady, N. Y.—A magneto-generator connected between the sliding contacts of the car, actuated by a stud, and a rack and pinion so arranged that the foot of the motorman may rotate the magneto-generator to pick up the switch contacts at starting.

589,787, 589,788, 589,789, 589,790, 589,791, 589,792 Closed-conduit electric railway; W. B. Potter, Schenectady, N. Y.

589,794 Brush holder; G. Reist, Schenectady, N. Y.—Consists of a box in which the brushes are mounted, an equalizer extending between the brushes, and a spring for applying pressure to the brushes.

589,798 Multiple cut-out for telephone systems; A. B. Strowger, Chicago.

TRADE NOTES.

The Western Electric Company's inclosed arc lamp is being pushed with the usual vigor of that company, which indicates great confidence in their own material.

The Standard Underground Cable Company, of Pittsburgh, has just established a southeastern sales department with headquarters at Rooms 1225 and 1226, Betz Building, Philadelphia, with Mr. T. E. Hughes in charge as manager of the department.

"Salfire" is the name of a ready-for-use electrical paint which has been placed on the market by Partrick & Carter Company, 125 South Second street, Philadelphia. This paint is made in two colors, gray and brown, and is indorsed and recommended by Wm. McDevitt, chief of the electrical bureau of the Philadelphia Fire Underwriters' Association. This paint is said to be sweet and clean, with no odor, and is waterproof and fire-resisting.

Westinghouse Company Gets a Large European Contract.

The Westinghouse Electric and Manufacturing Company has just received from its European company notice of the award to it, by the Metropolitan Electrical Supply Company, of the contract for a large electric lighting plant to be installed in London. The apparatus will be of the multiphase type, involving the use of the Tesla patents, which are owned in England by the Westinghouse company. It is understood that the contract amounts to between $350,000 and $400,000. All of the electrical apparatus will be made at the works of the company in East Pittsburgh.

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To persons making the greatest number of words out of the phrase "Patent Attorney Wedderburn." For full particulars, write the National Recorder, Washington, D. C., for sample copy containing same.

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